PUBLIC PRIVATE COLLABORATION ON CLIMATE CHANGE MITIGATION

A LOCAL GOVERNANCE PERSPECTIVE

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BY
KASPER DIRCKINCK-HOLMFELD

DISSERTATION SUBMITTED 2015

AALBORG UNIVERSITY
DENMARK

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Dissertation submitted April 2015

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THESIS DETAILS

Thesis Title: Public Private Collaboration on Climate Change Mitigation – A Local Governance Perspective

Ph.D. Student: Kasper Dirckinck-Holmfeld

Supervisors: Associate Professor Carla Smink, Aalborg University
Associate Professor Stig Hirsbak, Aalborg University

In the main body of this thesis, the following papers are included as chapters:

Paper 1: Dirckinck-Holmfeld, K. (submitted), "Challenges for Obtaining Business Energy Savings: Results from a Local facilitation Program", *Energy Policy* (Submitted March 2015). Forming the essential of chapter 5.

Paper 2: Dirckinck-Holmfeld, K. (2015), "The options of local authorities for addressing climate change and energy efficiency through environmental regulation of companies. *Journal of Cleaner Production* (in press), http://dx.doi.org/10.1016/j.jclepro.2014.12.067. Forming the essential of chapter 6.

Paper 3: Dirckinck-Holmfeld, K. (2012). Can energy utilities play a role in local political energy savings program? In Proceedings from *ECEEE 2012 Summer Study on Energy Efficiency in Industry*. (p. 11-20). European Council for an Energy Efficient Economy, ECEEE. Forming the essential of chapter 7.

Paper 4: Dirckinck-Holmfeld, K. and Jørgensen, M. (submitted). "The municipality as a "reflective dialogue partner" for energy savings in local companies". Journal of Cleaner Production (Submitted March 2015). Forming the essential of chapter 9.

In addition to these papers, the following publications have been made during the PhD.

- Remmen, A., Dirckinck-Holmfeld, K. & Nielsen, E.H. (2015). Renere teknologi - virksomheden, myndighederne og miljø. I Arler, F. Mosgaard, MA. & Riisgaard, H. (red). *Bæredygtighed - værdier, regler og metoder*. Aarhus University press. Attached as Annex B.
- AAU (Dirckinck-Holmfeld, K.) (2014). *Carbon 20 Moniteringsrapport for 2013* Accessed Sep. 01, 2014, from

http://www.carbon20.dk/billeder/filer/Publikationer/FinalmonitoringreportCarbon20.pdf

- AAU (Dirckinck-Holmfeld, K). (2013). *Addressing and overcoming barriers for energy savings in business: Experiences from 7 municipalities facilitation of 100 Danish companies*. Paper presented at ERSCP-EMSU conference 2013, Istanbul, Tyrkey.
- AAU (Dirckinck-Holmfeld, K.) (2013). *Carbon 20 Moniteringsrapport for 2012*. Carbon20. Available http://www.carbon20.dk/billeder/filer/Moniteringsrapporter/Carbon20Moniteringsrapportfor2012.pdf
- Dirckinck-Holmfeld, K., & Smink, C. (2012). *Can local environmental regulation of companies deal with a broader environmental view?* Paper presented at GIN2012.
- AAU (Dirckinck-Holmfeld, K.) (2012). *Carbon 20 Moniteringsrapport for 2011*. Available http://www.carbon20.dk/billeder/filer/Moniteringsrapporter/Carbon20Moniteringsrapportfor2011.pdf
- Remmen, A., Dirckinck-Holmfeld, K., Bauer, B., Bode, I., & Egebæk, K. (2012). *Miljørigtigt design af elektronisk udstyr*. Miljøstyrelsen.

This thesis has been submitted for assessment in fulfilment of the PhD degree. The thesis is partly based on the submitted or published scientific papers and other publications listed above. Parts of the publications are used directly or indirectly in the thesis. As part of the assessment, co-author statement has been made available to the assessment committee for the paper that forms the essentials of the chapter 9. This co-author statement is also available at the Faculty.

ENGLISH SUMMARY

This PhD thesis is the joint presentation of the results of my PhD study on how local authorities can influence local companies to reduce their emission of Climate Greenhouse Gasses (GHG).

The PhD draws empirically on my participation in a specific three years EU life+ financed project, the Carbon 20 (LIFE09 ENV/DK/000366). In this project, the seven Danish Green Cities municipalities have entered "Partnership Agreement" with 120 companies to reduce their GHG emissions by 20%. The main concept has been to offer the companies an energy screening, whereas the companies have "committed" to implement the proposals, to monitor their emissions and continually evaluate progress together with the municipality. In addition the project also included: Innovation projects with a selection of the participating companies; a facilitated exchange of experience among the participating municipalities on their activities towards local business support and green growth; as well as different activities focusing on the municipal participants learning from the project.

The report contains three parts.

In Part A the content of the research field is introduced in terms of both the specific contextual object of study and the main academic framework addressed. Chapter 1 introduces the background for local governments governance on the climate change mitigation and specifies the research questions based on the insight of the Carbon 20 project. Chapter 2 present the epistemological and methodological choices and consequences of a participatory phonetic research approach. It further present two core research interests in terms of a learning perspective and critical governance perspective both providing specific insight and feedback to the particular case under study as well as its broader impact and relevance. Chapter 3 present a conceptual framework for the specific studies carried in part B of the PhD thesis, whereas chapter 4 explain how the subsequent analyses address different elements of that framework.

In Part B the core analyses carried out during the PhD is presented. In total six different sub-analyses have been conducted. Five of the analyses look into depth at different elements of the studied field, whereas the sixth analysis combines the insight from these into an overall assessment. The challenges of the businesses in order to implement energy savings are analysed in chapter 5. Chapter 6 analyses the possibilities of the environmental officers in the municipalities to address climate change, energy, etc. in prolongation of the direct environmental regulation of companies. Chapter 7 analyses the experience of cooperation between the municipalities and energy utilities on providing energy screening free of charge in

light of the national Energy Efficiency Obligation (EEO) scheme. In chapter 8, the municipals initial activities to combine local business support with the climate and environmental agenda under the concept of green growth are analysed. Chapter 9 analyses the learning of the municipal officers during the project in respect to their interactions with companies. This analysis is developed further in chapter 10 into an assessment of the competencies needed to help companies address the challenges analysed in chapter 5 using governing techniques discussed in chapter 6, 7 and 8. In each of these six analyses, different elements of the conceptual framework are addressed bringing in various academic debates related to among others: regulatory approaches, energy gap and barriers, business development and public policies for innovation and growth, public private partnership and collaboration as well as organisational learning and change agents.

In Part C the conclusions and perspectives are drawn in terms of both its tangible contribution to the Carbon 20 case and the Danish context, but also the potentially relevance of the experience and discussions in a broader context e.g. as inspiration for other practitioners as well as its contributions to the different academic discussions. Chapter 11 summarises the conclusions from the six sub-analyses of part B in light of the conceptual framework and formulated practical research questions. In chapter 12 a generic model is proposed in order to formulate a municipal strategy to influence local companies to mitigate climate change. In chapter 13 the two research interests (Learning- and governance perspectives) are addressed in terms of discussing what the PhD has contributed to in respect of: the participating municipalities learning; learning that can be of inspirations for others practitioners; insight into the Danish regulatory framework that could be altered; as well as the contributions to a variety of different academic discussions.

DANSK RESUME

Denne Ph.d. afhandling udgør den samlede præsentation af resultaterne af mit Ph.d. studie med fokus på, hvordan kommunerne kan influere lokale virksomheder til at reducere deres CO_2 udledninger.

Ph.d. projektet tager empirisk afsæt i min deltagelse i et konkret EU finansieret treårig projekt, Carbon 20 (LIFE09 ENV/DK/000366). I dette har de syv danske Green Cities kommuner indgået en "partnerskabsaftale" med 120 virksomheder om at reducere deres CO_2 udledning med 20%. Hovedkonceptet har været at tilbyde virksomhederne gratis energiscreeninger mod, at de "forpligter" sig til at arbejde med at implementere forslagene og indvilger i at monitere deres emissioner og løbende gøre status over arbejdet sammen med kommunen. Projektet har yderligere involveret forskellige innovationsprojekter med et udpluk af de deltagende virksomheder, et specifikt erfaringsudvekslingsforløb omkring kommunernes aktiviteter i forhold til at fremme lokal grøn vækst, samt ikke mindst forskellige specifikke aktiviteter med fokus på de kommunale deltagers læring fra projektet.

Rapporten er inddelt i tre dele.

Del A udgør introduktionen til problemstilling og den akademiske ramme for projektet. I kapitel 1 introduceres til genstandsfeltet for Ph.d.en i form af lokale myndigheders "governance" aktiviteter ift. klimaforandringer. Med afsæt i Carbon 20 projektet identificeres forskellige konkrete problemstillinger og det akademiske felt antydes. I kapitel 2 argumenteres der for de videnskabsteoretiske og metodiske valg og konsekvenser af det empiriske afsæt i Carbon 20 projektet i form af et deltagerorienteret phronesisk forskningsideal. I kapitel 2 identificeres også to bagvedlæggende forskningsinteresser i form af hhv. et læringsperspektiv og et kritisk governance perspektiv. Endelig etableres i kapitel 3 en overordnet konceptuel ramme for præsentationen af de enkelte delanalyser, der udgør del to af rapporten og Kapitel 4 er en forklaring af, hvordan de seks delanalyser er relateret til den konceptuelle ramme.

I del B gennemføres seks forskellige delanalyser. Fem af analyserne går i dybden med forskellige delelementer af genstandsfeltet, mens den sjette samler op på tværs. Ud fra fokuseringen og diskussionerne i løbet af Carbon 20 projektet er det valgt at analysere på følgende: I kapitel 5 adresseres virksomhedernes udfordringer med at implementere de identificerede løsninger; I kapitel 6 undersøges de kommunale miljømedarbejdernes muligheder for at adressere klima, energi m.v. i forlængelse af miljøgodkendelser og miljøtilsynsarbejde; Kapitel 7 er en undersøgelse af erfaringerne med samarbejdet mellem kommunerne og energiselskaberne i relation til den nationale energispare ordning; Kapitel 8 analyserer kommunernes

begyndende aktiviteter med at kombinere øget ansvar for erhvervsudvikling med klima- og miljødagsordenen i form af grøn vækst; I kapitel 9 undersøges de kommunale medarbejderes læring igennem projektet ift. deres interaktion med virksomhederne; Disse fem delanalyser kombineres i kapitel 10 i en sjette analyse af, hvilke kompetencer, der skal til for at kunne hjælpe virksomhederne til at adressere de analyserede udfordringer.

I del C samles der op på hvilke konklusioner, der kan drages ud fra Ph.d.en ift. både dens konkret bidrag til Carbon 20 casen og den danske kontekst, men også hvad der potentielt kan drages af erfaringer i form af både inspiration for andre praktikere, samt i forhold til de forskellige akademiske diskussioner. Kapitel 11 er en opsamling af konklusionerne fra de seks forskellige delanalyser i del 2 ift. den opstillede konceptuelle ramme og de konkrete problemstillinger. I forlængelse heraf foreslås i kapitel 12 en specifik generisk model for at formulere en kommunal strategi for, hvordan en kommune kan influere lokale virksomheder ift. klimaforebyggende tiltag. Endelig konkluderes der i kapitel 13 på de fremlagte forskningsmæssige interesser i forhold til både læringsperspektivet og det kritiske governance perspektiv.

ACKNOWLEDGEMENTS

This PhD dissertation could not have been completed without help from many people to whom I am very grateful.

This thesis is based on the experiences of the Carbon 20 project financed by EU Life+. A special acknowledgement goes to all the partners and persons involved in Carbon 20 as well as the EU for funding the project and thereby partly this PhD. I especially would like to thank the participating municipal officers for spending their valuable time for consecutive interviews and conversations forming the core empirical base of the PhD. Without your engagement this PhD would not have been possible. I do hope that it also added value for your work, since the PhD has intended to provide specific feedback to you.

Special thanks go to the municipality of Allerød for providing me an office space for six months and thereby hands-on experience into the day-to-day practises of the municipality as well as participating in their interactions with the companies.

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Thanks to Michael S. Jørgensen and Susse Georg for their comments at critical moments. Karsten Kryger Hansen for layout assistance during the last stressful days and to Kirsten Smith for sharing office location and involving me in teaching and thereby reminding me that the academic life is also an opportunity to get inspired by new ideas among students.

Special thanks goes to Arne Remmen and Lone Dirckinck-Holmfeld for the many successive academic insights and discussions throughout my life, but also for your valuable contributions specifically to this work.

Thanks to my family and friends for keeping me reminded about a life besides climate change, governance, green growth and energy efficiency. I owe extraordinary gratitude to my family, who has suffered in my mental absence. At times it seemed that this would become a never-ending story. It didn't. Thank you Janne for keeping confidence in me, especially in the periods of frustrations. Thanks to Elva and Asta; also for your nice drawings given the final touch to this thesis.

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PART A. INTRODUCTION AND ACADEMIC FRAMING

CHAPTER 1. INTRODUCTION

The topic of this PhD thesis is: how can municipalities influence local companies in reducing their emissions of greenhouse gases (GHG).

Numerous Danish municipalities have adopted climate action plans, setting ambitious targets to reduce GHG emissions. Copenhagen, for instance, wants to be the first carbon neutral capital in the world by 2025. This target extends beyond the municipality's own directly controlled emissions as it relates to the geographical area of the municipality – not the municipality as organisation/institution. This means that emissions from all activities within the municipality are included and not solely emissions from the municipalities' own directly controlled activities. The emissions from the businesses and households located in the municipality are also covered.

A successful implementation of climate action plans therefore implies that municipalities are able to motivate and engage both households and businesses within the municipality to reduce their GHG emissions. The focus of this PhD thesis is on the latter. The study is empirical based on the EU Life+ funded project, Carbon 20 (LIFE09 ENV/DK/000366). Municipalities participating in the Carbon 20 projects are the six municipalities forming the collaboration "Green City" – respectively Copenhagen, Albertslund, Ballerup, Allerød, Herning and Kolding – as well as Næstved, who at the time of the Carbon 20 application for EU Life+ was a candidate to join the "Green City".

The municipalities in the Green City partnership have committed themselves to specific green targets. One of the targets involves reducing GHG emissions from the whole geographical area of the municipalities (including companies and dwellings located within the municipality) by 20%. The Carbon 20 project is one of several activities being used to reach this goal.

The Carbon 20 project (www.carbon20.dk) targeted the engagement of 120 companies in lowering their GHG emissions by 20% over a three-year period (2011-2013). The main elements[1] covered in the project were:

- Establishing voluntary agreements[2] with each of the companies, including offering energy screening for the companies free of charge,

[1] The project included a range of different activities under four overall objectives (Gate 21, n.d.-a). During the project the tasks was redefined, renamed and given different emphasis. The listed elements are those that I conceive as the central ones for the focus of this PhD.

[2] Called the Partnership Agreement in the Carbon 20 project.

- Motivating companies to move beyond harvesting "the low hanging fruits" and engage in innovation and/or target non-energy related reductions – For instance transport, food and food waste, lifecycle of products and supply chains etc.
- A facilitated exchange of experiences among the seven municipalities about how to use the climate focus actively as driver for local business development under the banner of green growth, as well as
- Enhancing the competences and skills of the municipalities to facilitate companies to reduce their GHG emissions

This PhD thesis is based on the experiences and knowledge obtained from the Carbon 20 project in respect of how the seven municipalities involved engaged and influenced the local business sector to achieve GHG emission reductions.

This chapter introduces the background to municipality engagement in the climate change agenda, the specific Carbon 20 project as the empirical basis, the research field and focus as well as specific object and research questions based on the experiences of the Carbon 20 project.

1.1. BACKGROUND – MUNICIPALITIES AND CLIMATE CHANGE MITIGATION

Municipality engagement in climate change and their efforts to engage and influence local business to alter their practices follows an increased international, national and business focus on climate change mitigation and the green growth debate.

This section introduces the debates as the background for presenting the place and role of municipalities in respect to this debate.

CLIMATE CHANGE MITIGATION IN THE POLITICAL AGENDA GLOBALLY, EU AND NATIONALLY

Climate change has become a "hot" political topic. The Intergovernmental Panel on Climate Change (IPCC) stated in their synthesis of the 4th assessment reports from 2007 that global warming is taking place, and that it is *very likely* caused by human activities resulting in the release of GHG. They set a rather indicative "tipping point" of a maximum two degree Celsius increase in temperature, and called for urgent action to minimise emissions in order to stay within this limit (IPCC, 2007).

In relation to the recent 5th assessment reports the certainty of the cause of global warming is strengthen from the *very-,* to be *extremely likely* caused by human activities – extending it from a 90% to a 95% probability (IPCC, 2013). The report from the second working group shows that the temperature increase has levelled out

over recent years, but also that the actual experienced consequences of past emissions are far more extreme than expected. One of the reasons for the levelling out is not lower emission, but that the effect of the oceans as a CO_2 buffer has been greater than anticipated. This has resulted in a more rapid acidification of the oceans with severe consequences, such as those for coral reefs, and the ocean lives dependent on them (IPCC, 2014).

For several years the UN has orchestra global negotiations to establish mutual commitments for reducing GHG emissions to mitigate climate change –The United Nations Climate Change Conference with yearly session of the Conference of the Parties (COP). Up to the 2009 summit in Copenhagen (COP 15), Denmark, as host, lobbied strongly to settle a new mutual agreement to replace the Kyoto protocol that expired at the end of 2012. There was a joint political acknowledgment of the problem and the need for action to stay within the suggested two degree Celsius increase as the tipping point put forward by the IPCC 2007 report. Neither the COP 15 nor its successors have succeeded in reaching a new binding global agreement (Dimitrov, 2010). The process continues. Following the publication of the 5th synthesis report by the IPCC, the aim is to reach a new, universal climate change agreement at COP 21 in Paris, 2015 (UNFCCC, 2014).

COP 15 was in many ways viewed as a disappointment (Dimitrov, 2010), e.g. expressed by the European Parliament (e.g. European Parliament, 2010). The Copenhagen summit did show a diversity of actors actively engaging in the climate debate, covering leading companies, NGOs, entrepreneurs and civil society, as well as several local cities led by the city of Copenhagen as host.

One outcome of these activities was the creation of the Green Growth Leaders (GGL) as a Council of 30-35 members from the fields of policy, science, civil society and business. Founded by the Nordic think tank Mandag Morgen, several large Danish companies and the city of Copenhagen, their objective is to push for a transition to a "low carbon sustainable tomorrow" (Green Growth Leaders, n.d.). In 2012 this initiative was transformed to the initiatives of "Sustainia" with the aim of "creating a vision of what a sustainable future could look like" – also hosted by Mandag Morgen. This encompasses, among other things, a yearly publication of one hundred promising sustainable solutions, "the Sustainia 100" (Sustainia.me, 2014).

Several initiatives with similar focus also exist, specifically for cities. For instance C40 – a network of megacities such as New York, London and Rio de Janeiro, but also "innovative" cities such as Copenhagen – appointed to be member of the steering committee. The aim of C40 is to develop and implement programmes and policies that reduce GHG emissions and climate risks, and share knowledge and experience among cities through several sub-networks in specific areas (C40, 2014).

In spite of the lack of a new global agreement, EU and its member states have made (internal) commitments to reduce GHG emissions.

Up to the COP 15, the EU had committed to internal binding target to reduce overall GHG emissions by 20% compared to 1990, levels by 2020[3]. The EU combined this target with a target of 20% use of renewable energy, and an indicative target of 20% efficiency improvement in energy use – the so-called 20-20-20 targets for 2020. The EU even declared a willingness to increase the reduction target to 30% if other major economies also undertake ambitious reduction targets (European Commission, 2014a).

These targets are currently under revision. In 2011 the commission introduced a roadmap proposing the long-term aim of an 80% reduction by 2050 with milestones of a 40% reduction by 2030 and 60% by 2040. In January 2014 the Commission launched the negotiations on the 2030 target, but these negotiations were postponed (European Commission, 2014b; European Commission, 2014c).

The EU has taken several actions to reach these targets, such as the Energy-Efficiency Directive. Inspired by schemes in, among other places, the UK and Denmark, one of the requirements of this directive is that member states to set up an energy efficiency scheme (EEO), that obliges the national energy utilities (distributors and/or retail energy sales companies) to achieve energy savings at end users in terms of businesses and dwellings (Directive 2012/27/EU).

Denmark has advocated for ambitious GHG reduction targets both in the EU and globally. Up to the COP 15, the former Danish climate minister Connie Hedegaard (and former EU climate commissioner after the COP 15) invited various heads of state to Greenland to see the melting of the glacier. She also visited the US congress, among other organisations, to emphasise the possibility of combining a focus on climate with maintaining economic growth by highlighting the Danish

[3] The GHG emission reductions target refers generally to GHG emissions covering activities within a given geographical area – not to the GHG emissions that are caused by the activities within the territory. In other words, products consumed within, for example, Denmark, but produced outside the country will not be counted as part of Denmark's GHG emissions, but those of the country in which they are produced. Various attempts have been made to include such emissions in order to stress that a large part of the GHG emissions of, for example China, should in principle be allocated the consumption in western countries (Frese and Andersen, 2006; Frese et al, 2008; Chrintz, 2012). Calculating the ecological footprint of countries (more broadly than solely GHG emissions) the report 'Living Planet' places citizens in Denmark as having the fourth biggest ecological footprint in the world (WWF, 2012). Calculating such global footprints is, however, a challenging task in terms of scope, delimitations and data quality providing a range of possible outcomes.

wind turbine venture, and that Denmark has managed to decouple energy use from economic growth by keeping energy consumption stable in recent decades (Hedegaard, 2008).

Denmark has also set quite ambitious reduction targets. The most recent targets have been increased from a 30% to a 40% reduction in GHG emission by 2020 compared to 1990 level (Regeringen, 2013a).

In 2011, the Danish government formulated a long-term target of making Denmark independent of fossil fuels by 2050. A prerequisite for being able to realise this target is that total energy consumption is lowered. This calls for a double strategy in terms of both increasing energy production based on various types of renewable energy (RE), and lowering overall energy consumption by means of improved energy efficiency and energy savings (The Danish Government, 2011). See Figure 1

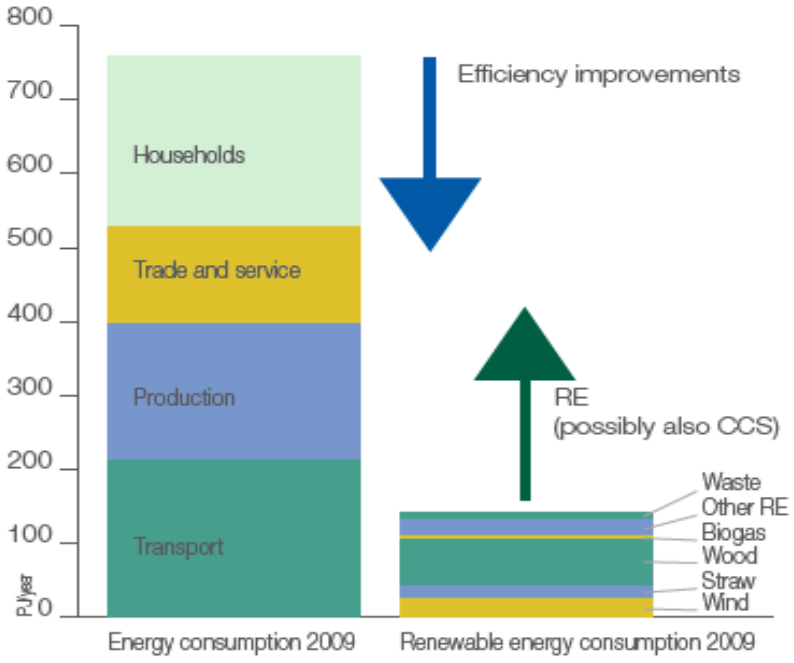


Figure 1 – Energy consumption and renewable energy (The Danish Government, 2011:17)

Energy efficiency is thus an integral element in Denmark's overall policies on energy and climate change, which among others includes an obligation for the

energy utilities to find savings at end users (Business and households) – EEO (Togeby et al. 2009).

CLIMATE CHANGE MITIGATION ON THE BUSINESS AGENDA

Several companies are also actively engaged in combatting climate change. In spite of the lack of an international agreement and thus no coherent global political framework, several global companies such as Wal-Mart, BMW, Apple, and Philips have put climate mitigation high on their agenda and are disclosing their GHG emissions e.g. through the Carbon Disclosure Project (www.cdp.net) (see e.g. Apple, 2014 and Wal-Mart, 2014; see also CDP, 2014). This includes several big Danish companies such as Carlsberg, Novozymes, Grundfos and Danfoss, who all have made climate a high priority for their businesses and have implemented various forms of environmental and GHG reporting in their organisation and/or products (e.g. Carbon footprints) (Carlsberg Group 2013; Danfoss 2013; Grundfos 2013; Mærsk Group, 2013; Novozymes, 2014).

Several of these companies have set targets for reducing their emissions internally, but are increasingly also beginning to look at their supply chain. A survey of multinational companies commissioned by the Carbon Trust Advisory in the UK in 2011, for example, found that 50% of multinationals will in the future select their suppliers based upon carbon performance, and 66% even express willingness to pay a premium for products or services with low emissions (Dynamic Markets, 2011; Carbon Trust, 2011).

CLIMATE CHANGE AS DRIVER FOR GREEN GROWTH

In 2008 the global economy was hit by a financial crisis resulting in a downturn of economic activities. The number one priority of most western countries has been recovering the economy and job creation, which has left rather little political room for other agendas, including the environment and climate (e.g. Nielsen, 2011).

This economic downturn has affected the momentum of the climate and environmental agenda (e.g. the EU decided to postpone further commitments); however, the two agendas have also been attempted linked by the concept of green growth – for example, the highlighted Green Growth Leaders (among others Huberty et al., 2011a; Huberty et al., 2011b).

Several international organisations, such as UNEP and OECD, argue that the climate challenges combined with challenges of, for example, resource scarcity, land use and biodiversity, call for a change towards a green growth path – a new global green deal. On the one hand the environmental challenges facing the world are serious and call for substantial investment and ambitious standards that cannot be postponed due to the current downturn of the economy. On the other hand,

meeting these challenges necessitates new green innovations and investment that has the potential to catalyse a green growth path out of the crisis (Barbier, 2009; OECD, 2009; OECD, 2011; UNEP, 2011).

The EU has, in the same way, called for a rebooting of the EU economy by addressing societal challenges including the environment and climate, but also societal challenges such as unemployment, poverty, an ageing population etc. In 2010, the EU adopted its 10-year growth and job strategy "EUROPE 2020 - A strategy for smart, sustainable and inclusive growth" (European Commission, 2010a). This includes seven flagship initiatives. Two of these address specifically that respectively EU's innovation and industrial policies should be targeted towards finding solutions for such societal challenges (European Commission, 2010b; 2010c). A third of these flagships address resource efficiency as a central element, including the need for a re-orientation of waste policies that reinforces the reuse and recycling of resources (European Commission, 2011).

In Denmark, the transition to a low carbon, resource efficient economy is also discussed in relation to a recovery of the economy calling for green growth. The current government in Denmark has in its "regeringsgrundlag" (agreement between the coalition forming government pointing out the directions for that government period), for example, specifically addressed the use of the climate and green challenges as the basis for green growth (Regeringen, 2011). It also has launched both a climate action plan and a resource strategy, both specifically emphasising this green growth element (Regeringen, 2013a; 2013b).

Both the international organisations, EU and the Danish Government argue that meeting such societal challenges and making them an engine for new growth is challenging. It calls for increased public private collaboration and partnering to find and induce the implementation of such solutions (European Commission, 2010a; OECD, 2011; Regeringen, 2011; UNEP, 2011).

CLIMATE ON THE AGENDA AMONG LOCAL GOVERNMENTS AND CITIES

A group of actors who have taken up the challenges of climate change are the local governments.

In 1993, ICLEI - Local Governments for Sustainability (previous "the International Council for Local Environment Initiatives[4]) - launched the Cities for Climate Protection programme (CCP) as one of their first major programmes. The concept

[4] ICLEI was established in 1991 in connection with the 1992 UN conference on sustainable development in Rio and with a focus on Local Agenda 21.

of CCP was that local cities committed themselves to a continued process of monitoring and action towards lowering their GHG emissions. ICLEI has been active in the successive UN COP conferences in climate change. At those they have argued that the local governments are in a central position in respect to actually impose change and realise savings among their citizens and local businesses. The World Mayors Council on Climate Change was founded in 2005 and at the COP 16 summit in 2010, local governments were officially recognised as governmental stakeholders in these global negotiations (Bulkeley and Newell, 2010; ICLEI, 2014; Zeppel, 2013).

In addition to the C40 networks of mega- and "innovative" cities already mentioned, several similar networks exist, such as:

- Energy cities http://www.energy-cities.eu/
- Global green cities http://globalgreencities.com/
- Sustainable cities http://www.sustainablecities.eu/

This increased focus on cities as central actors has encouraged the UNEP, UN Habitat, Word Bank and City Alliances establish a Knowledge Centre for Cities and Climate Change (K4C) that "*serves as a platform for sharing experiences and best practices, as well as facilitating exchange of innovative initiatives*" (K4C, n.d.).

Similarly the EU launched the "Covenant of Mayors" initiative in 2008 as one of the means to reach its 20-20-20 targets. The covenant is an agreement by mayors of cities within the EU. The mayors' commit to implement an action plan that aims to meet and exceed the EU 20-20-20 targets**.** In March 2014, more than 5,000 European cities had signed the agreement – 36 of which were Danish (Covenant of Mayors, n.d.).

In Denmark, 76 municipalities (out of a total of 98) have joined an agreement with the Danish Society for Nature Conservation (DN – Danmarks Naturfredningsforening) to cut CO_2 emissions[5] by 2% (absolute) every year. Contrary to the Covenant of Mayors and Carbon 20 this relates solely to their own directly controlled activities; the municipality as an organisation, and not the geographical area. The focus in these agreements has primarily been on energy savings (DN, 2012).

Several Danish municipalities have expanded this restrictive focus on reducing CO_2 emissions from their own operations to cover the whole geographical area of the

[5] CO_2 is generally used in the Danish context, but refers to CO_2 equivalent and thus includes all kinds of GHG. CO_2 and GHG are applied interchangeably in this PhD.

municipality[6]. This means that the GHG monitoring, action plans and so on not only cover reductions from activities that the municipality directly controls, but also include GHG emissions from the local community as a whole, including the activities of citizens and businesses located within the area of the municipalities (e.g. Albertslund kommune, 2009; Nielsen et al. 2009).

This is a substantial enlargement of focus, as the municipalitis' own activities generally only count for a minor share of total emissions. Most emissions are instead attributed to, respectively, private households, the business sector and sometimes transport[7]. See Box 1.

[6] A few municipalities have also attempted to make calculations that include CO_2 emissions from activities outside the municipality geographical area, but can be attributed to the activities inside – e.g. consumption of products produced elsewhere, but consumed by citizens. Allerød has, for example, made such an account. Applying such calculations will extend the CO_2 emissions attributed to each of the citizens to approximately 20 tons a year instead of 9 tons a year using the traditional geographical area boundary (2006 figures) (Allerød Kommune, 2011a).

[7] Overall distribution figures have not been found, but the climate action plans of various municipalities – notably those taking part in the Carbon 20 project – show a huge diversity in how the emissions are distributed and what is included as sources for the emissions. The municipalities are different in respect to demography etc. The method applied for calculation diverges significantly between different municipalities – even between the cities cooperating in the Green City forum. Some use the distribution of emissions between different sources (district heat, electricity, oil, land use and/or transport etc.), while some allocate emissions to various sectorial categorisations (municipality institutions, citizens/households or dwellings, the business sector, agriculture, or/and transport sector (again) etc.). Some municipalities combine those methods. This makes it difficult to actually make comparisons and assess the general figures with respect to how the emissions are distributed among the various sectors present in the municipalities.

In Allerød (2009 figures) private households account for almost 49% of CO_2 emissions, while the business sector counts for more than 31%. The municipality as an institution counts only for 6% (Allerød Kommune, 2011a).

In Ballerup (2006 figures) the local business sector can be attributed 59% of emissions, whereas the citizens are responsible for almost 19% and the municipality as an institution for only 3%. The rest 19% is in Ballerup attributed to transport. Ballerup is one of the municipalities in Denmark with the largest concentration of businesses compared to inhabitants (Ballerup kommune, 2010).

In Albertslund (2006 figures), the transport sector counts for 31% of emissions, the business sector 36%, and the housing/dwelling sector for 21%. The municipality as an institution counts for 10% (Albertslund kommune, 2009).

Box 1 - Distributions of GHG emission among three Municipalities of the Carbon 20 project (The respective municipal action plans on climate change mitigation)

The municipalities need to activate both citizens and the local business sectors in order to successfully implement their action plans and reach the targets.

In general, the municipalities have commenced their focus on the climate agenda by looking at their internal options for improvement (own directly controlled activities), broadening towards first the citizens and dwellings sector and subsequently starting to focus also on the business sector.

A survey of municipality progress with regard to acting on climate mitigation conducted by "Local Government Denmark" (the interest group of Danish municipalities - Kommunernes Landsforening, KL) estimated that 35% of the municipalities measure their CO_2 emissions with respect to the whole geographical area, while the rest include only their own directly controlled emissions (KL, 2010). According to a similar survey in 2010 by Concito (a Danish green think tank), only a small number of those municipalities measuring the CO_2 in respect to the geographical area have an active policy towards engaging citizens and businesses – and significant less in respect to the business sector compared to citizens (Concito, 2010).

Since 2010, several municipality driven projects have targeted the engagement of both the private dwelling sector and the business sector. Examples of projects covering the latter include: Project Zero in Sønderborg, Network for Sustainable Business Development in North Denmark (NBE) (Aalborg and Holstebro), Klimaklar (Climate ready) in Odense and Carbon 20.

A resent study by another Danish thing tank (Det økologiske råd) confirms that the municipalities' activities towards the business sector have increased. Only below 40% do not have any activities towards addressing energy efficiency in local

companies. The study still emphasis that the level and character of activities differs significantly with only below 20% of the municipalities having what they frame as high level of activity including those seven of the Carbon 20 project in focus of this PhD (Jarby and Vincentzen, 2015).

Against this background, the focus of this thesis is an analysis of municipality activities towards engaging and influencing the local business sector to reduce their GHG emissions. It will take its empirical base in the experiences of the municipalities participating in the Carbon 20 project.

1.2. THE CARBON 20 PROJECT

Carbon 20 is a EU Life+ funded three years project (2011-2013) carried out by seven[8] Danish municipalities collaborating in the Green Cities Partnership (Green Cities, n.d.). The municipalities include the capital inner city, Copenhagen, and three surrounding suburban municipalities: Albertslund, Ballerup and Allerød. The remaining three municipalities are middle-sized cities (by population). Herning and Kolding are in mid- and south Jutland respectively, and Næstved is in south/west Zealand. Aalborg University[9] also participates in the project.

[8] Næstved is as mentioned not a member of this partnership, but at the time of the EU application Næstved were contending (a candidate) to become a member and therefore also part of the Carbon 20 project

[9] At the beginning of the project the Technical University of Denmark (DTU) also participated, but the person in charge changed position to AAU during the project and took the project task with him to AAU.

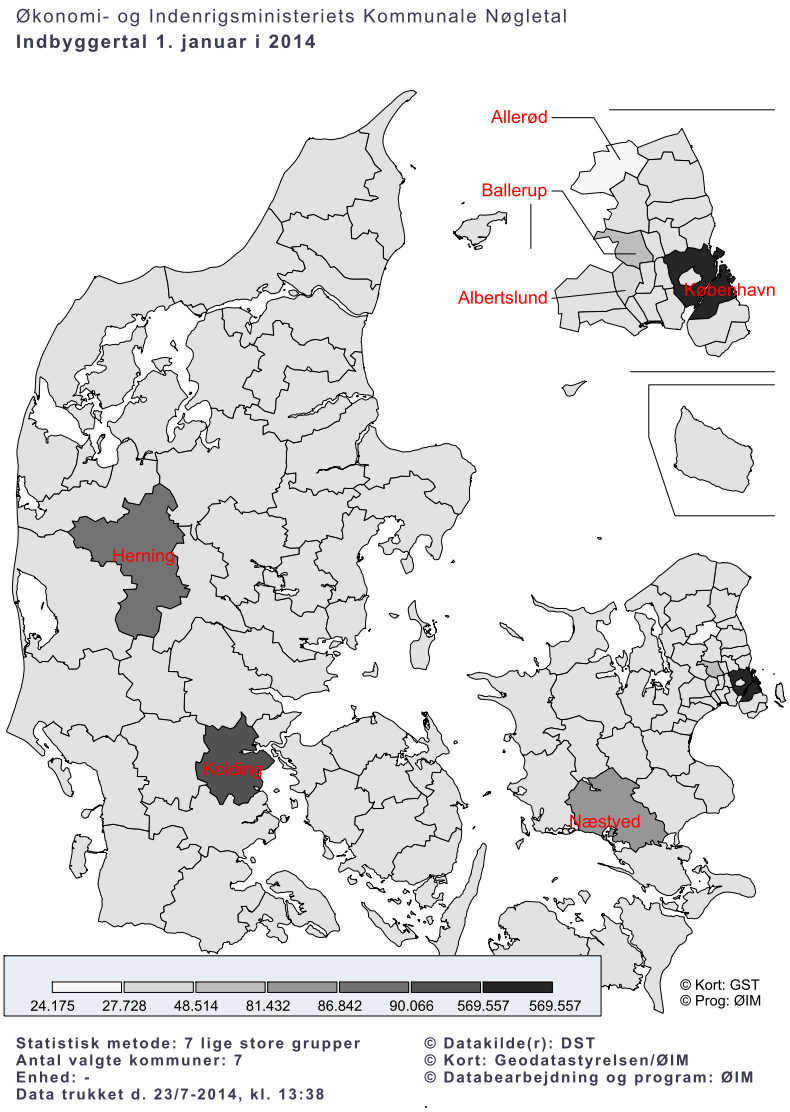


Figure 2 – Map of Denmark with the seven Carbon 20 municipalities (ØIM, 2014)

In the Green Cities Partnership the municipalities have made mutual green commitments to several specific targets. One of these includes a commitment to reduce the CO_2 emissions within their geographical area by at least 20%. The Carbon 20 project is an attempt by the participating municipalities to work together in building up their abilities to engage the local business sector in achieving this target.

The purpose of Carbon 20 is: *"to strengthen the cooperation on CO_2 reductions between city governments and companies"* (Gate 21, n.d.-b).

The main concept has been that the seven municipalities have engaged 120 local companies (primarily small and medium sized companies – SMEs) to commit themselves to strive for a 20% reduction of their own GHG emissions.

For each of these companies the municipalities have entered a "partnership agreement"[10]. As part of the agreement the companies are offered an energy screening free of charge. In return the companies agree to (Gate 21, n.d.-c):

- Work constructively together with the officers from the municipalities, consultants, universities etc. to adopt an action plan;
- Engage in the implementation of that plan and have follow-up meetings with the municipalities; and
- Monitor the GHG emissions to document reductions using a simplified web-based CO_2 emission reporting scheme where they as a minimum should report their direct emissions and emissions derived from their use of electricity (Scope 1 and 2)[11].

Supplementing this core element, the project also included three additional central components:

- Specific activities to motivate and facilitate companies to go further than solely harvesting "the low hanging fruits" by engage in innovation and/or target non-energy related reductions – for instance transport, food and food waste, lifecycle of products and supply chains etc.

[10] In the Carbon 20 project, this agreement is called a partnership. Basically, this would earlier have been called a voluntary agreement with limited consequences for companies that did not fulfil their commitments

[11] Emissions are monitored through the application of a Danish web-based calculation scheme: http://www.climatecompass.dk. This follows the GHG protocol in terms of Scope 1, 2 and 3 (direct emissions from use of oil products, transportation etc.; indirect emission in terms of the use of electricity and/or district heating (emissions both dependent on own reduction of consumption, but also the degree of RE in the production of such); and finally their indirect emissions in terms of sphere of influence (emissions at supplier and/or customers, emissions from products and/or employee commuting etc.). The companies committing themselves to this project agree to monitor emissions related to Scopes 1 and 2 (Danish Industries and the Danish Business Agency, n.d.).

- A facilitated exchange of experiences among the seven municipalities about how to use climate focus actively as a driver for local business development under the headline of green growth
- Enhancing the competences and skills of the municipalities to facilitate companies to reduce their GHG emissions by among other arranging specific competence development courses.

1.3. THE RESEARCH FOCUS - LOCAL GOVERNMENTS GOVERNANCE OF CLIMATE CHANGE

The objective of this PhD thesis is to investigate how municipalities can influence local companies to reduce their emissions of greenhouse gases (GHG). The empirical basis is the Carbon 20 project and the participating seven municipalities. The background to this has been presented above, with respect to the global, national and local political debates. In this section the research field is presented with respect to the academic contributions on the role of local government in the governance of Climate Change. This is used as the point of departure for a further specification of the focus. Based on the empirical engagement in the Carbon 20 project, the specific research objects is presented in terms of the specific focus within the research field.

RESEARCH FIELD – PAST ACADEMIC INSIGHTS

Hulme (2009) argues in his book '*Why we disagree about climate'* that the very framing of the climate change challenge (as a global problem of average temperature increases, as local increases of extreme weather event or others) has implications for the understanding of the problems and its potential solutions as well as which actors are important.

Bulkeley and Newell (2010) argue for a broadening of the governance perspective of the climate change agenda.

They argue that the traditional framing of the climate change challenge as a "global problem" according to its global effect has led to an extensive academic focus in the global negotiations on agreeing on a global political framework. Attention has been very much on the sovereign nation states – and especially the (economically) powerful ones – as the central actors in terms of both agreeing on the framework and the subsequent realisation of GHG reductions. Focus on the global negotiations has been broadening in terms of recognising that several different actors – e.g. NGOs, global companies and business alliances – interact in these negotiations to influence the outcome. They are, however, still mainly seen in respect of their lobbying activities in the different member states (Bulkeley and Newell, 2010).

Bulkeley and Newell (2010) show however that the recent framing of the GHG challenges has been broadening out in terms of, for example, putting more emphasis on the global and local processes causing the GHG emission. This provides a platform for broadening the governance perspective in terms of which actors are central in affecting these processes, and thus also putting more emphasis on the implementation processes and actors engaged in them. The traditional governance focus on climate change has assumed a rather hierarchical top down implementation. This has now been opened up to a much more diversified governance framing (Bulkeley and Newell, 2010).

Betsill and Bulkeley (2006) specifically highlight the way that the ICLEI engagement in the climate agenda has hijacked such past academic framing. On the one hand the municipalities and local government organised in ICLEI are part of the hierarchical governance system under the nation states, however organising themselves in such transnational networks and working not only to exchange experiences in terms of mutual learning, but specifically attempting to influence the global negotiations, makes them appear more as NGOs in traditional framing (Betsill and Bulkeley, 2006).

They therefore propose a "new" framing in terms of the concept of multilevel governance taken from the academic writing of the EU[12]. They argue that the multilevel perspective can add to the perspective on climate change in terms of providing both a focus on governmental ties between different vertical levels of government (global, regional, national, regional and local), and a broadening of the various governing modes of public private interactions. They term such as respective Type I and Type II governance. Type I is governance across hierarchically levels, whereas Type II is governance interactions with non-public entities (Betsill and Bulkeley 2006; Betsill and Bulkeley 2007; Bulkeley and Newell 2010). Others (e.g. Bache and Flinders 2004) use respective vertical- and horizontal governance to cover the same distinction between the vertical links between different governmental levels and horizontal public private interactions (see Chapter 3).

Betsill and Bulkeley (2007) argue that the research agenda on local government engagement with the climate change agenda has been expanded since it took off in the late 1990s. The preliminary focus was – and to a large extent still is – on the myriad of specific ways – or modes of governing – in which local authorities have

[12] In the EU such trans-European collaboration of local government has been institutionalised for more than 20 years resulting in the establishing of the Committee of the Regions (CoR) in 1992 with the objective of "*playing a dual role: to help shape European legislation, and to act as a direct link between the European institutions in Brussels and the citizens of Europe*" (Committee of the Regions (EU), 2014)

addressed climate change. While this is still of interest, the focus is often enlarged towards also analysing the processes, drivers and barriers for local authority activities with respect to both Type I (vertical) and Type II (horizontal) elements of the multilevel governance perspective (Betsill and Bulkeley 2007).

Bulkeley and Kern (2006) make a distinction between four different modes of governing as a basis for examining (comparing) local government climate change activities in the UK and Germany:

- *Self-governing* of own activities;
- *Governing by provision* of services for citizen and business;
- *Governing by authority* through the use of regulation and distinctions; and
- *Governing through enabling* in terms of facilitating and encouraging action by others.

They find – in line with KL (2010) – "*that the majority of measures undertaken in relation to climate protection are concentrated in the self-governing mode and in the energy sector, in particular in the energy management of municipal properties*". They point to various different barriers that hamper local government further engagement with the agenda – covering both mitigating and adaptation measures (Bulkeley and Kern, 2006: 2242).

Based on a literature review Sippel and Jensen (2009) made a list of a variety of both motivators and barriers for local authority engagement in the climate change agenda covering both mitigation, adaptation and all the different modes introduced by Bulkeley and Kern (Sippel and Jensen, 2009).

This thesis adds to this literature by focussing specifically on the role of the municipalities in their interaction with local companies so as to influence them in reducing their GHG emissions.

In contrast to both Bulkeley and Kern (2006), and Sippel and Jensen (2010), my focus is not the broad variety of means and actions that local government is applying to address the climate change agenda as a whole, but on the variety of means (modes of governing) that local government applies to influence mitigation by local companies – not the internal activities of local government nor their interactions directed towards influencing residential citizens, and not including adaptation.

With a focus on the interaction of local government in order to influence companies I find that Bulkeley and Kern (2006)'s use of different modes of governing are not quite suitable for my research topics. Within the governance literature others has however framed such different governing modes slightly different focused much

more specifically in respect to the governance interaction with citizens and companies.

In 2003 Kooiman introduced a framing of such modes of governing, looking specifically at the interplay between the public entity and private entities, and thus not including what Bulkeley and Kern term 'self-governing'. Kooiman (2003) distinguished between:

- *Hierarchical governance*, such as steering and control;
- *Enabling self-governance* in terms of influence actors to control their own actions; and finally
- *Co-governance* where governing and governed actors specifically work together to achieve targeted goals (Kooiman, 2003).

Kooiman (2003)'s self-governing resembles Bulkeley and Kern's (2006) concept of governing through enabling. Kooiman's co-governance could cover aspects that in principle would be under the domain of Bulkeley and Kern's self-governing, or even governing through provision. In an earlier contribution, Kooimann (1993) outlines this co-governance to cover a range of such co-constellations in terms of co-regulation, co-steering, co-production, cooperative management and public private partnerships (Kooiman, 1993) (see further discussion of Kooiman in Chapter 3).

The municipalities (local government) participating in the Carbon 20 project have committed themselves to reaching mitigating targets. The Carbon 20 is one of several initiatives to achieve this target. The local authority commitments are thus in this thesis taken as a given. The thesis therefore does not address the municipality motivations for committing themselves to such a target. What is addressed, however, is an in-depth assessment of the means – or modes of governing – applied during this Carbon 20 project – an implementation perspective rather than formation perspective.

The aim is to bring specific insight into the options and constraints for the officer's activities in influencing companies. Both in respect to adding to these above academic discussions, but also to – as a researcher actively involved in the Carbon 20 project – bringing feedback to the participating municipalities (and officers) and the context they act within.

Further to the overall governance focus on how municipalities can influence local companies to reduce their emissions of greenhouse gases (GHG), another goal of this thesis is the underlying objective of enhancing the practises (capabilities) of the seven municipalities.

RESEARCH OBJECTIVES

The focus is on the municipalities and their interaction with companies. The overall research objective is to be able to provide insight into the municipality experiences, and thus contribute to (see elaboration in chapter 2):

1) Strengthening the municipalities capabilities in terms of providing feedback and suggestions for the specific Carbon 20 municipalities;
2) Dissemination of insights to other municipalities;
3) Discussing the appropriateness of the overall regulatory/societal frameworks that the municipalities act within; and
4) Contributing to the overall academic discussions and understandings of local government roles in the governance of climate change.

The PhD thesis is primary based on empirical insight from interaction with the municipal officers engaged in the Carbon 20 project. The core focus is on the municipalities, and how they engage in, and perceive, their options for influencing companies to act on climate change mitigation.

The term "influencing" is deliberately chosen, as it is understood to be broad and inclusive in terms of capturing various means and approaches – modes of governing – that the municipalities can apply. "Influence" is thus applied in this thesis as an all-inclusive term that covers a range of different governing means including, for example e.g.:

- Imposing and enforcing norms;
- Promoting, facilitating and enabling actions either in extension of (or part of) the authority role (regulation and planning), connected to business support activities or other services that imply interactions with companies;
- In cooperation with external agencies such as energy consultants, district heat utilities etc., to establish attractive services or facilitation packets for the companies,
- Using its procurement activities actively, and/or
- Even entering specific cooperation with companies to co-create solutions and services (co-production).

In short, the municipalities can apply a broad variety of approaches and means to influence companies ranking from command-and-control, inspiration, encouragement and enabling, as well as facilitation, cooperation and even co-creation.

1.4. THE OBJECT OF STUDY – THE SPECIFIC CONTEXT OF ANALYSIS

Below I will outline the object of the study in the thesis in terms of which elements of these influencing activities I will look into more deeply throughout this PhD - delimitated by the empirical departure from the Carbon 20 project

The object of study can be illustrated in this way:

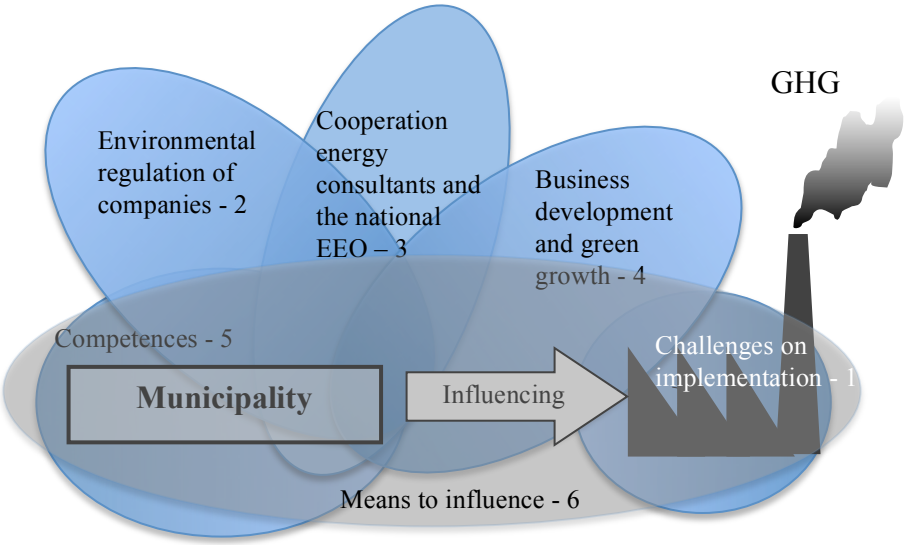


Figure 3 – Illustration of the object of study (Own production)

The Figure 3 illustrates that the overall research object is fragmented down into five different elements or sub-analyses, which are combine in a sixth assessment.

A preliminary element in discussing how municipalities can influence a change among the companies is to understand the context of the companies that the municipalities attempt to influence. A first step in this PhD is therefore to assess the challenges companies are facing with the implementation of the various solutions as a basis for understanding what the municipal officers actually need to be able to address (1). As the perspective applied is that of the municipalities, this assessment will depart from their understanding of the challenges.

The next step is an investigation of the specific approaches and means that the municipalities have and can use to influence companies. The intent is to provide

insight into both the options and constraints for the municipality activities. In principle this could include several areas that municipalities could potentially address in their interaction with companies. Based on the experiences of the Carbon 20 project, three fields of interest are addressed specifically in this PhD in respect to:

- Expanding focus and approach during the direct environmental regulation of companies to address climate and energy (2)
- Utilise the national energy efficiency obligation scheme (EEO) to get energy consultants to address the companies committed to such local programmes (3)
- Combine the climate and energy agenda and enlarged formal responsibilities towards business support as core targets in terms of green growth (4).

As already presented, a central element in the Carbon 20 project was to enhance the competences of the municipal officers to engage and influence the companies to address the climate agenda. A focus of this PhD is to discuss the learning of the municipalities in that respect (5)

In direct prolongation, I will further assess how the municipalities and the municipal officers can address the specific challenges highlighted in step 1, combining the insight gained from the specific analyses of step 2, 3 and 4. This will form a sixth step in terms of which means are suitable to use (6).

Below I will argue for a specific focus on these core elements based on the experiences during the Carbon 20 project.

CHALLENGES THAT COMPANIES FACE IN THE IMPLEMENTATION OF MITIGATION OPTIONS (ENERGY SAVINGS)

During the course of the Carbon 20 project and the implementation of the partnerships agreement with the companies, the municipalities found that the companies showed quite different achievements for a variety of reasons. In an attempt to draw some possible learning and overall knowledge of how to address and motivate companies to engage in GHG reduction, the Carbon 20 project decided to specifically monitor the company challenges in actually implementing the solutions highlighted. This will be the focus of a first analyse of this PhD.

ENVIRONMENTAL REGULATION OF COMPANIES

The Carbon 20 project was anchored in the environmental departments, often with the strong involvement of the units responsible for directly regulating the company's environmental performance – the local environmental authorities[13]. In this way, the task is an extension of municipality permit and inspection activities. This anchoring of the project makes municipality environmental regulation of companies a central platform for maintaining focus on climate and energy issues after the termination of the Carbon 20 project - "after Life+". A central analyse is therefore to look at this regulatory framework and how the officers involved in Carbon 20 can integrate the GHG agenda into their normal day-to-day interaction with (and regulation of) the local companies.

Danish municipalities – including the majority of those in the Carbon 20 project – have experience in facilitating companies to improve their environmental work, centred on terms such as pollution prevention and cleaner technologies/production, which have been included as central principles in the Environmental Protection Act since 1991. Many Danish municipalities have since the 1990s taken participated in regional networks (e.g. the Green Network), organised around the environmental officers actively promoting the implementation of environmental management systems (EMS) (Bauer et al. 1998; Forman and Jørgensen 2004; key2green, n.d.; Lehmann 2008; Moesgaard et al. 2010).

Departing from these past experiences, a second analyse of this PhD address the municipalities' options to address GHG emission and energy within the environmental regulatory framework.

CONNECTION TO THE NATIONAL ENERGY EFFICIENCY OBLIGATION SCHEMES

A central element in the (voluntary) partnership agreement between the municipalities and companies in the Carbon 20 project was to provide energy screening free of charge. The idea was to utilise the existence of the national energy

[13] The first Environmental Protection Law from 1971 delegated a high degree of responsibility to local authorities, including the municipalities, as competent authority for issuing and enforcing environmental permits for polluting companies. The municipalities have specific legal competences (and responsibilities) to regulate companies in the environmental field. This delegation is maintained today with modifications in terms of number and types of companies covered under their jurisdictions (Moe, 2000; Miljøministeriet, 2011).

efficiency obligation scheme, requiring energy utilities to find energy savings for the end-users – private households and businesses. The concept was to cooperate with energy consultants in realising savings among the companies committed to the Carbon 20 project. The companies reporting of the achieved saving to the national scheme should then "pay" for the screening in terms of contributing to fulfilling the energy utilities obligations.

In contrast to the environmental field, the municipalities did not have a tradition of addressing energy and the Climate agenda specifically in their interactions with companies (only promoted as sub-element in EMS schemes). The energy and Climate agenda has been more or less "left" to the various schemes administrated by the Danish Energy Agency[14] (Engel et al., 2005).

The municipalities are rather new in this field of influencing the energy savings of end-users, which means that they need to negotiate their role and navigate a field with several different national schemes and actors already in place. It is therefore interesting to investigate the experiences of Carbon 20 in respect to this cooperation between the municipalities and the energy consultants in relation to the overall national energy efficiency obligation scheme. The objective is to discuss the suitability and perspectives for further such cooperation after Life+. This is the topic of a third analyse of this PhD thesis.

[14] The Danish Energy Agency (ENS) hasn't had a tradition of delegating responsibility to the lower administrative levels, such as the municipalities (as opposed to the environmental field). ENS has themselves managed several diverse programmes targeting energy savings and energy efficiency dating back more than 25 years, including specific activities directed at the companies. From 1996 ENS entered voluntary agreements with a large number of the big companies in Denmark. The companies committed themselves to implementing a certified Energy Management System and realising energy savings with a simple payback of less than four years. In reward they received a significant rebate on their CO_2 levies - up to almost 40% (37.6%) (Krarup and Ramesohl, 2002; Ericsson, 2006; Togeby et. al., 2009; Togeby et. al., 2012). As an extension of the EU CO_2 quota system, the levy system was adjusted significantly, resulting in a gradually reduction of companies actually subject to the particular levy in question. The basis for the agreement scheme was thus altered considerably and finally abandoned in 2013 (Togeby et al., 2009; Togeby, 2012; Energistyrelsen, n.d.; 2012). In parallel, ENS established an energy efficiency obligation scheme requiring the energy utilities to find energy savings among both companies and citizens. The concept was that the utilities have freedom of method to secure a focus on the most cost efficient savings – resulting a de facto creation of a market for selling energy savings (white certificate scheme). Such cost efficient savings are often in the bigger companies - exactly those previously covered by the "voluntary" agreement scheme (Togeby et al., 2009; Togeby et. al., 2012).

THE CLIMATE AGENDA AS THE POINT OF DEPARTURE FOR LOCAL GREEN GROWTH AND BUSINESS SUPPORT

The Carbon 20 projects included two elements extending focus further from this initial partnership agreement centred on the energy screenings: 1) motivating some of the companies to move beyond implementing known solutions highlighted in the energy screening and encourage them to innovate, and 2) organising a specific facilitated exchange of experiences among the municipalities, on their activities in using the green agenda as a vehicle for supporting the local business sector – local green growth.

In a comprehensive reform of the Danish governmental system, the municipalities were provided with more formal competences and responsibilities towards business development and -support (e.g. Iris Group, 2010).

During the economic downturn following financial crises of 2008 several municipalities experienced a decline of the local businesses community.

In response to both the increased responsibilities and the economic downturn, several municipalities are beginning to place increased focus on having a prosperous local business sector and addressing this specifically in its varies policies.

Mirroring the increased focus of the EU and national governments on grand challenges as possible drivers for renewed economic growth, several of the municipalities in the Carbon 20 project has also attempted to combine the renewed focus on supporting local business in respect to meeting municipalities and societal challenges.

Under the headline of 'green growth' the project decided to look more closely into how to use environmental and climate concerns to promote innovation and growth. This will be addressed as a forth analyse of this PhD.

COMPETENCES OF THE MUNICIPALITIES

A central element of the Carbon 20 project was also to enhance the competences of the participant municipal officers. This included a variety of elements including among others several specific competence development workshops. In addition to introducing specific topic of relevance, these workshops were among other things also used as forum for exchange of experiences and successive discussions of the role and approach of the municipal officers in the interaction with companies on this energy and climate change agenda. A fifth element of this PhD is to reflect on these discussions on the role and competences of the municipal officers and their learning during the project.

1.5. RESEARCH QUESTIONS AND STRUCTURE OF THE PHD THESIS

Based on the experiences from the Carbon 20 project, the overall research question (problem statement) is:

How can the municipalities influence local companies to lower their GHG emissions?

The overall research question has – as already outlined in Figure 3 and the following text – been divided into five specific element subject for different sub analyses. The 5 sub-research questions for these is:

- What are the challenges that companies face in reducing GHG emissions through energy savings? (1)
- What are the municipality options for engaging with the companies on energy and climate in respect to:
    - Options in extension of direct environmental regulation? (2)
    - Use of energy consultants? (3)
    - Business support and green growth? (4)
- Which competences should the municipal officer possess for influencing companies (5)

The findings from each of these five elements are subsequently combined into a specific sixth assessment of how the municipal officers can address the challenges analysed trough sub-question 1. This sixth assessment thereby provides some preliminary conclusions on the overall research questions – however focussed on the level of the competencies of the municipal officers.

In the concluding part C of this PhD thesis the specific findings from all these six separate analyses is turn in to a broader answering on the research question on the municipal level suggesting an generic model for how to organise initiatives towards influencing local companies to address reduction GHG emissions. The specific answering of this - the practical research problem - is than followed by conclusion in respect the specific research interest elaborated more in next chapter.

The analyses and investigations of each of these 5 sub-questions as well as the preliminary sixth answering on the overall research question on the officer levels form the core of this thesis in terms of Part B.

Part B consists of the Chapters 5-10. Chapter 5-9 present the core analyses of the 5 core elements and sub questions, whereas Chapter 10 combined the insight from

each of the five analyses. The chapter 10 expand on the findings of chapter 9 in respect to incorporate the findings from chapter 6, 7 and 8 in an assessment of how the municipal officers can use the competences discussed in chapter 9 specifically in respect to address the challenges found in chapter 5.

The analyses carried out in respect to chapter 5, 6, 7 and 9 is presented in the form of scientific articles with each having own abstract, introduction, method and conclusions etc. This means that the insight of these four chapters is presented as a "stand alone" document on their own terms – meaning that they can be read and understood without this overall framework in terms of this coherent presentation of the PhD. They do however still form five distinct perspectives on the same overall issue of concern in this PhD. Each of these chapters therefore includes a preliminary introduction inserting the article into the PhD framework.

- Chapter 5 (Paper 1) is summited to the journal Energy Policy march 2015.
- Chapter 6 (Paper 2) was published in the Journal Cleaner Production 2015 (e-publication ahead of publication).
- Chapter 7 (Paper 3) was published in the proceedings from ECEEE 2012 Industrial Summer Study.
- Chapter 9 (Paper 4) is summited to the Journal Cleaner Production march 2015.

Before going into the core of the analyses of the thesis, **Part A** of the thesis set the scene. In addition to this chapter 1 introducing the background, research fields and objectives, Part 1 includes:

Chapter 2 that explains the epistemological and methodological point of departure centred on using the Carbon 20 project as the empirical case that set the direction for the specific research focus – naming this "a participatory problem based phronetic research approach". The chapter further outline the variety of methods and data collected. The chapter also presents a diversification into 4 different underlying research objectives (the scientific problems related to the initial practical problem) in respect to respective a learning and governance perspective: 1) contributing to the learning of the particular Carbon 20 officers and municipalities, 2) presenting possible learning that could be of interest to other municipalities, 3) providing specific suggestions for changes to the overall Danish regulatory framework, and 4) add to the academic discussion of local governance related to climate change mitigation.

Chapter 3 extends Figure 3 in terms of establishing an overall conceptual framework for the coherent presentation of the six interconnected analyses and assessments of chapter 5-10. This framework will depart from the governance discussions, but also include a learning perspective.

Chapter 4 will elaborate on Chapter 3 and show how the six subsequent chapters capture the various elements in that framework. This has been judged necessary, as the development of this framework has been an iterative and dialectical process, where the different core assessment has been carried out simultaneously and some further presented as "stand alone papers". The specific wording of these does not necessarily follow the framework of Chapter 3.

Part C is the overall conclusions and perspectives to be drawn from the PhD thesis

Chapter 11 follows up on chapter 4 and draws op the main conclusions from each of the Chapters 5-10 specifically in respect of the conceptual framework presented in Chapter 3. Chapter 11 thereby brings the findings from the chapters 5-10, were some were presented as stand-alone-paper, into the wording and conceptualisation presented in chapter 3 and followed up in chapter 4.

Chapter 12 is an extension of these conclusions bringing the conclusion up from the emphasis on the officer level to on organisational level of the municipal. In chapter 12 a generic "model" for a successive extended municipal strategy for influencing local companies is presented.

Chapter 13 takes a third look at the findings throughout the PhD thesis in light of the specific epistemological and methodological considerations and the four scientific research objectives (scientific problem) presented in Chapter 2 in terms of respective the learning perspective and governance perspective each taking both a specific view on the case of Carbon 20 as well as broader perspective.

CHAPTER 2. METHODOLOGY - PARTICIPATORY PROBLEM BASED PHRONETIC RESEARCH

In the previous chapter the focus and objectives was outlined leading to the research questions of the PhD project. This chapter explains the methodological approach in terms of:

- Epistemology and principles of knowledge production,
- The methodical considerations and specific applied method for collecting and processing empirical data.

2.1. EPISTEMOLOGY AND PRINCIPLES OF KNOWLEDGE PRODUCTION

The PhD takes its point of departure within a problem-based, interdisciplinary and contextual practice-oriented science.

Being problem-based means to identify and seek solutions to a specific societal problem. The departure from a specific contextual problem implies that the character and the interpretation of the problem and the context that surrounds it will guide the method both in terms of the empirical data and the concepts and theoretical perspectives which serve to formulate, interpret and solve the problem (Adolphsen, 1985; Illeris, 1974; See also Baastrup et al., 1999).

First, however, what is a problem?

Adolphsen (1985) makes a distinction between a practical problem, and the theoretical problems that underlie it. A practical problem is, according to Adolphsen, a problem related to human practice. A practical problem is something that behaves in a way other than expected or wanted. It can be solved without the need to understand the reason it occurred in the first place – such as by following an instruction (Adolphsen, 1985).

A theoretical problem or a scientific problem is, according to Adolphsen, an anomaly in relation to our knowledge, understanding or explanation of the world (Adolphsen, 1985: 31). It is something that occurs, behaves or acts differently or surprisingly according to our past knowledge, understanding or explanations. Adolphsen proposes that for every practical problem there is a theoretical or

scientific problem. The practical problem changes to a theoretical problem when questioning and assessing the reason for the practical problem experienced.

The character of the questions asked then determines what kind of scientific knowledge is going to be addressed, such as seeking (or questioning) explanations within the social science sphere, natural science sphere or the humanities.

Kjærsdam and Enemark (1994) expand on these interdependencies between practical and theoretical problems in terms of picturing iterative interdependencies between everyday development, applied sciences and what they frame as pure science or paradigmatic knowledge. The model illustrates how a practical problem has a practical solution, however it also has a related "theoretical" problem and "theoretical" explanations in the form of the applied sciences. In that sense, the applied sciences frame the practical problem, and provide solutions informed by the applied sciences, however, the theoretical problem may lead to anomalies with respect to our overall knowledge, understanding and explanations of the world and require more fundamental questions and investigations in order to really solve the embedded scientific problem. Anomalies (or scientific problems encountered) may alter in the conceptual understandings of other fields and eventually even imply a change in any paradigmatic basic assumptions (Kjærsdam & Enemark, 1994).

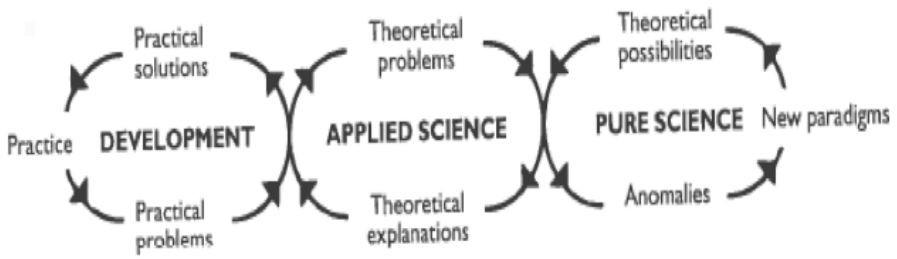


Figure 4 – The dynamic interplay between development in practise and pure science (Kjærsdam & Enemark, 1994: 16)

Problem-based research has been criticised for being without theoretical/scientific implications in never managing to reach beyond the practical problem at hand – remaining on the surface, and thus failing to assess the underlying courses (e.g. Goldstein, 2003; Poulsen, 2010). This is a challenge - and a challenge that this project should take seriously - and yes, there are examples of failure to make a proper problem analysis.

Conversely, it can also be argued that "pure science" in many aspects (at least in the social sciences) will likely generate more or less useless and/or indifferent research. Examples include rigid neoclassic economist challenges to analyse, understand and explain the financial crises. This challenge partly relates to the fact that traditional economists try to abstract from the context in making mathematical models that fails to integrate the actual practice of people and take into account the context-specific conditions that influence economic behaviour (see e.g. Fullbrook, 2007a; 2007b for an elaboration of this critique).

Problem-based research is precisely attempting to bridge such gaps by engaging in a dialectical iterative process between grasping what constitutes the practical problem experienced and the underlying reasons and explanations for such problems – what Marx (and Hegel before him) framed as the dialectics between appearance and phenomenon ("fremtrædelsesform og væsen"). As such the problem-based approach supports the development of a deeper and conceptualised understanding of the specific problems of appearance, their nature, and causes, and thus comes up with explanations that might question the existing knowledge of the problem under study. Problem analyses are often done in collaboration with the actors having the problem, and in that sense problem orientation also acts as an impetus to query the general knowledge creation developed in the "Ivory Tower" university tradition.

Below I will deepen these discussions.

In relation to the first challenges of going beyond the sole practical problems as they appear, I will turn to Illeris' contribution to problem orientation. While his point of departure is an individual learning perspective in terms of student experiences, he also introduces "criteria" for the selection of relevant problems that point at broader questionings of existing structures. Among other things he introduces the concept of "group participant driven" and "social relevance" criteria for directing problem orientation towards more fundamental questionings of societal structures.

In relation to the second issue of the appropriateness of "pure science" I turn to Flyvbjerg (e.g. 1999; 2001). He specifically questions the appropriateness of applying more "idealised" context-independent logic, rationalising and theorising approaches when conducting research on human activities. He instead argues for contextual progressive phronetic social science research assessing the contextual phenomena of (a) particular case(s).

Based on these contributions I will elaborate how these two approaches have inspired the research approach used for this PhD.

PARTICIPANT STEERING AND SOCIAL RELEVANCE AS CRITERIA FOR PROBLEM BASED RESEARCH

One of the exponents of problem-based research in a Danish context is Knud Illeris. Illeris specifically attempts to formulate problem orientations as basis for the emerging alternative didactical and scientific revolting of the 1970s. One of his achievements is to combine the pragmatic US approach and experimental learning as formulated by, among others, Dewey (e.g. 1938) with German critical theory (Frankfurter School), and especially Oscar Negt (1975).

In his 1974 work "Problemorientering og deltagerstyring" ("Problem Orientation and Participant Steering"), Illeris specifically draws on Dewey to point out that the higher educational system needs to address topics that take their departure in the experiences of students. He specifically argues that the students take the active lead in their learning processes in terms of developing, formulating, exploring and assessing a selected problem of interest. He was, however, like Dewey, concerned that such education doesn't end in extreme individualism; but actually also prepares students for the future requirements of active participation in society. He does, however, conceive this as consisting of a dual objective in terms of both preparing the students for the perceived current expectations and qualifications of society (companies and institutions), but also to critically question those established understandings so as to actually drive society further. In his later book of 1985 this was framed as "double-qualification" pedagogy (In Danish actually named "opposing qualification" - Modkvalificerings pædagogik) (Illeris, 1974; Illeris, 1981).

Illeris suggest as a first element to centre the process on the principle that students form groups around common interests, and collaborative develop and assess the problem. This – Illeris argues – transforms the problem at hard from a matter of only individual interest and experience into group dynamics in terms of developing a shared understanding and experience of the surrounding society. It further adds to prepare the student for democratic negotiation and for active participation in discussions and the scientific process of knowledge creation (Illeris, 1974).

This group Participant Steering means that the problem of interest becomes more broad and qualified by added diverse perspectives. This is however not sufficient in Illeris' perception. He therefore in addition seeks criteria for selecting problems that points at broader "exemplarities" (Illeris, 1974).

For such exemplarities he abandon the established disciplinary understanding and knowledge as inappropriate. He argues that the departure in the problem calls for an interdisciplinary approach as real problems may cut across established disciplinary boundaries and are therefore not necessarily explained properly by disciplinary theories. He argues that the problem-based method is interconnected to an

interdisciplinary research tradition. It is thus the chosen problem and the students' active framing of this that form the basis for which past knowledge, theories and conceptualisations are relevant for the further assessment of that problem (ibid).

In contrast to seeking such exemplarity in the dominating disciplinary approaches and theories, Illeris turns his attention to German critical theory (Frankfurter school), and especially the German sociologist Oscar Negt. Illeris (1981) is inspired by Negt (1975)'s concept of "sociological imagination and exemplary learning". Illeris translates Negt's concepts into a criterion of societal relevance for the research problem. The inspiration from Negt is particularly emphasised in Illeris book of 1981 compared to the previous book of 1974.

Oscar Negt writes in his book "Sociological Imagination and Exemplary Learning" (1968 – here the Danish translation *Sociologisk fantasi og eksemplarisk indlæring* (1975) was used) specifically about an educational programme directed at the working class with the object to:

> "… give the working class the opportunity – through learning – to collectively (conscious or unconscious) experience and give them a political directionality" (Translated from Danish, Negt 1975: 7).

Like Dewey, Negt also argues that education needs to address the specific experiences of the participants in terms of making it relevant for them. In addition he also argues that "good and relevant experiences" to address in the educational process are those experiences which provide students with insight into the "objective[15]" societal knowledge structures and mechanisms, setting the boundaries for such experiences.

Negt's use of exemplarity is an attempt to make the working class conscious of some of the exploitations and suppression mechanisms of capitalist societies, and as such part of the political formation process of the working class – a societal exemplarity that points at the "objective" interest of the working class (Ibid).

Writing on the higher education system – and not working class education as Negt – Illeris departs from this narrow criterion in respect to the political formation of working class. He instead renames it to a criterion of "societal relevance". He does however maintain a critical perspective on the capitalist society and as such his social relevance for choosing research problems still maintain a political dimension in terms of influencing the students to be critical on current societal structures (Illeris, 1981; see also Baastrup et al., 1999).

[15] Understood in the Marxist use of the word in relation to the working class "objective" interest – by which he meant what would be in their (economic) interest for the transformation of society (economically, socially and with regards to equality)

In contrast to Illeris' maintenance of a critical perspective as core to his societal relevance criteria, later contributions on the problem-based education have significantly levelled out on the critical perspective. In a student handbook on Problem based student projects, Olsen & Pedersen (1997) instead mainly emphasise that the qualifications obtained through the problem-based method are popularly requested by both private and public sector employers. The Societal Relevance is my Olsen & Pedersen is reduced to criteria that the projects are of relevance for other than solely the students themselves (Olsen & Pedersen, 1997**;** see also Baastrup et al., 1999).

In a tribute of Illeris, his former protégé, Lars Ulriksen (2009) argued that a re-reading of Illeris' publications could bring some of his critical perspectives back to the problem based research and thus function as a counterpoint to the latest year's profit driven argument for an increased focus on doing research in closer corporation with society and companies[16].

Ulriksen (2009) show how the concepts of problem- and experience-based project-oriented pedagogy had tremendous popularity in Denmark during the 1990s. However this popularity also changed the focus significantly. Even disciplinary approaches adopted the problem-/experience-based principles as the basis for making students familiar with the theories and concepts of the discipline through some rather tailor-made exercises and very structured processes. Several of the critical and societal relevance criteria were "forgotten" or seriously altered away from the more political aspect of the concept with a greater focus on the commercialisation of research as the society relevant criteria (Ulriksen, 2009).

WHY "PURE" SCIENCE FAILS WITHIN SOCIAL SCIENCE AND THE NEED FOR A PHRONETIC SOCIAL SCIENCE

Having above looked more closely at Illeris' attempt to identify criteria for making the problem-based research reach beyond the sole empirical focus of the problems at hand (or the way they appear on the surface), I now turn to arguments against relying (solely) on "pure science" c.f. Kjærsdam & Enemark (1994).

In his doctoral dissertation "Rationality and Power" of 1991 – translated to English in 1998 – and his subsequent 2001 publication "Making Social Science Matter: Why Social Inquiry Fails and How It Can Succeed Again", Bent Flyvbjerg

[16] Most directly formulated through the sentence "fra forskning til faktura" (from research to invoice) – first promoted by the Federation of Danish Industries and CO-Industri at a joint conference in 2001 with that name (Bæhring, 2010) and adopted by the former Minister of Science and Technology, Helge Sander who altered it to "fra tanke til facture" (from thought to invoice) (Ministeriet for Videnskab, Teknologi og Udvikling, 2003)

seriously questions the appropriateness of using general (natural science inspired) predicative theorisation in social science (and humanities). He argues instead for an approach that is based on the specific context. He calls this 'Progressive Phronetic Science' (Flyvbjerg, 1999) – later reformulated to 'Social Phronetic Science' (Schram et al., 2013).

His basis for this "deconstruction" of general science and the "construction" of a "new" contextual science departs from the role of experience in the formation of actions. He draws on learning models of Dreyfus and Dreyfus (1986) to point out that experience from particular and contextual situations plays a central and decisive role in our cumulative advance in respect to the development of specific skills and our actions in various specific situations – stressing tacit knowledge and know-how as fundamental for how successful learners react in specific situations. The argument is therefore that contextual tacit knowledge is important in forming our actions, whereas a generalised overall theory that is abstracted from this context fails to capture the actual action processes of given situations (Flyvbjerg, 1999; see also Dreyfus & Dreyfus, 1986).

Flyvbjerg argues that general rules and overall introductions (based on more generalised knowledge) can be valid as outset for introducing new topics. The ability to advance beyond a certain level, however, requires according to Flyvbjerg specific practical experiences and contextual understanding of the proper way to react in a specific situation. This applies even for games that are otherwise perceived as highly mathematical and rational such as chess. The Grand Masters of Chess do not (solely) uses rational calculations for their applied strategies, but largely rely on knowledge obtained from past experiences (their own as well as that from their acquaintance of others) and their ability to recognise and act on similarities. Contrary to the lower levels of chess, where mathematically interested and skilled persons dominate in number, the Grand Masters do not have the same overrepresentation (ibid).

Flyvbjerg draws the conclusion that contextual experiences have a higher learning (knowledge) level than logic-based general knowledge. Context is the central location for the acquisition (and production) of knowledge. It is because of experience that we remember different situations, and what worked, and did not. Our knowledge of the world is thus based on our cumulative contextual experience and (conscious as well as unconscious) processing of this (Flyvbjerg, 1999).

In contrast to chess and other more specialised problem areas, most adults are "experts" in day-to-day situations and decision-making. Likewise, most professionals are also more or less experts, or at least proficient, within their fields. Our decisions and actions in specific situations are thus generally not controlled by our consciously rational deductive logical reflections on specific matters, but more on our tactical knowledge about how to react in specific situations, obtained by

experience of similar situations – our ability to combine various past experiences in specific situations (Flyvbjerg, 1999).

People do (or at least ought to in terms of continuing active enhancement of their competences) reflect on their experiences in terms of what worked and what did not, but this again is more an element of forming the tactic knowledge of how to react, than a process of rationalising any general applicable rules of logic regarding how to react. This is precisely the centre of Flyvbjerg's argument against applying an analytical-rational logic-based approach inspired by natural science to form generally applicable theories about human actions.

Drawing heavily on Dreyfus (1982), but also Bourdieu (1977), he argues that context and practise do matter in terms of actually being decisive about human actions in specific situations, and even the understanding and definitions of the specific phenomena in the specific situation (Flyvbjerg, 1999).

Flyvbjerg specifically argues that two of the criteria for what he frames as "ideal theory" in terms of "general applicability" and "the ability to predict" contradict each other in the social sciences. The ability to make even the slightest prediction in social science rest upon an understanding of the particular meaning given a phenomenon in a given contextual situations (Ibid).

In contrast to attempting to make such generalised predicative science, Flyvbjerg argues for the need for a contextual science departing from an understanding and acceptance of the particular and contextual as important for the actual configuration of, and knowledge production within, social science and the humanities – or what Aristotle's framed as *Phronetic.*

Bent Flyvbjerg refers to Aristotle when making a distinction between three different intellectual virtues: episteme, techne and phronetic (prudence).

- *Episteme* is the scientific ideal that has been dominant in the twentieth century and relates to, among other things, rationalism. The focus of epistemological science is on universals and the production of generalised knowledge using general analytical rationality. The object of epistemological science is thus to provide universals that are invariable in time and space. Epistemological knowledge therefore appears context independent. Episteme concerns the question why (Flyvbjerg, 1999).
- *Techne* is craft or art. Techne focus on specific contextual activities, where knowledge and skills are applied to accomplish a specific and conscious goal. Techne is knowledge that focuses on how (ibid).
- *Phronetic* "*is the intellectual activity that is relevant to practice*." Phronetic is context-sensitive knowledge with a focus on values, and

> oriented towards action or practice. It is context dependent, and it is why Phronetic science cannot be performed using universal laws and rules. Phronetic research is based on practical value rationality, and is developed on the basis of experiences provided by working with case studies and examples. Like techne, phronetic focuses more on the question of how than of why. Phronetic research therefore places greater emphasis on "Verstehen than erklären" (ibid: 73).

Flyvbjerg specifically refers to Aristotle in terms of coupling prudence and political science. Flyvbjerg uses this to argue for the need for a phonetic social science and calls for context-dependent studies using examples and case studies to provide a counterpoint to the epistemic (rational and abstract) science dominating the social sciences (Flyvbjerg 1999; 2001).

> "The purpose of the study of human and society (...) is not the development of theory, but the contribution to society's practical rationality in thinking about how we are, where we are and where we are heading, as well as the desirability of such direction given different values and interests" (Flyvbjerg, 1999: 8 – own translation).

The objective of social sciences is not – as epistemology and natural science – to produce general overall "objective" knowledge, as this is not valid in respect to social processes. On the contrary, it is to provide insight into specific contextual developments and contribute to strengthening them – not from a presumably "objective" standpoint but from an informed value-directed perspective. What is important is not whether generalised theories can be tested (verified or falsified) or do provide plausible predictions on the object of study. Contrary phronetic science is interested in which experiences, learning and understandings of the specific situations can be obtained and used to both provide informed feedback about the specific object of study, and to add insight to conceptualisations from which others can learn in similar situations.

In his 1999 publication Flyvbjerg emphasises the use of case studies as a central method to get close to context and engage in providing relevant insight into the particular. Flyvbjerg's understanding of the case study diverts however significantly from the more traditional use of case and examples. Traditionally cases and examples are often used to either: verify/falsify the applied theories, or as method for preliminary hypothesis generation. Flyvbjerg opposite sees case studies (or other means to get close to the field (object) of study) as fundamental for formulating relevant knowledge and insight on social science matter. With the phrase *"the force of the example"* he does emphasise that the knowledge gained from such case studies indeed can be relevant as a learning perspective for other cases (Flyvbjerg, 1999; Flyvbjerg, 2006: 228).

Case studies in this context are thus not solely a specific method. An indebt case study (and other attempts to get close to the particular context of a study) often need to apply a variety of specific data about the case and thus apply a variety of different methods to obtain that data (Flyvbjerg 1999) – see more on case studies below.

In a later publication Flyvbjerg specifically links his notion of phronetic science to problem-based science – also arguing along the same lines that problem-based research needs to apply a flexible method in terms of including whatever perspective is judged suitable for adding valuable insight into a problem:

> Phronetic (...) research is not method-driven, even if questions of method may have some significance. Phronetic planning research is problem-driven. Therefore such research does not, and cannot, subscribe a priori to a certain method – for instance discourse analysis, statistics, or qualitative methods – even though each or all of these methods may prove relevant in a specific piece of research in order to address the specific problems at hand. It is impossible to be truly problem driven and at the same time committed to a certain method. (Flyvbjerg, 2004: 10f)

In that sense Flyvbjerg comes close to some of the arguments by the anarchistic philosopher of science, Paul Feyerabend:

> The idea that science can, and should, be run according to fixed and universal rules, is both unrealistic and pernicious. It is unrealistic, for it takes too simple a view of the talents of man and of the circumstances, which encourage, or cause, their development. And it is pernicious, for the attempt to enforce the rules is bound to increase our professional qualifications at the expense of our humanity. In addition, the idea is detrimental to science, for it neglects the complex physical and historical conditions, which influence scientific change. It makes our science less adaptable and more dogmatic: every methodological rule is associated with cosmological assumptions, so that using the rule we take it for granted that the assumptions are correct. … Case studies … speak against the universal validity of any rule. All methodologies have their limitations and the only 'rule' that survives is 'anything goes' (Feyerabend, 1975).

Flyvbjerg's intent is, however, to indicate some preliminary directions for how to conduct such value-directed contextual social science. For that he turns to Foucault for inspiration, arguing that Foucault has attempted to make such phronetic science. Flyvbjerg argues that Foucault himself – as with others who practice such phronetic research – are more concerned with developing the method through practising it

rather than writing about it. Based on especially Foucault some of the aspects Flyvbjerg specifically highlight are (Flyvbjerg, 1999):

- Engagement and disengagement
- Archaeology and genealogy, whereas archaeology is the process of registering events of the object of study, and genealogy is the assessment of the historical and politically produced meaning given these events and the phenomena of the object of study
- Dechiffrement meaning to deciphers the context out of original source material
- Eventualisation in the sense that Foucault stresses that "small questions" and "details – minutia" counts
- Discourses (conceptualisations are embedding certain meaning and contexts)

PHONETIC AND SOCIALLY RELEVANT PARTICIPATORY PROBLEM-BASED RESEARCH APPROACH IN THIS PHD THESIS

I have outlined how Flyvbjerg argues against attempts in social sciences to generate general overall predicative theories. He instead argues for what he frames as phronetic research, which from a specific value standpoint creates contextual research providing insights (and feedback) on the particular focus of study and learning to inspire future study (or actual execution) of similar focuses. I have also outlined how Illeris presents an alternative approach to the traditional disciplinary research departing from established theories and assumptions, where he instead argues for a study that is departing from societal problems and where the assessment of these problems in groups adds to opening the interpretations and dynamics of the problem. Below I will outline how these perspectives inspired the scientific approach of this PhD.

My point of departure is, as mentioned, a specific project, Carbon 20, and the municipalities participating in this. The object of study is thus the particular experiences of the municipalities within the context of the Carbon 20 project. As such I follow Flyvbjerg's notion of a contextual science of the particular. Following his directions for such, the intention of this study was not to generate, test (verify/falsify) or develop any overall generally applicable theory or knowledge about how municipalities in all circumstances and within different contextual settings can act to influence companies on the topic of GHG reductions. What I am addressing is to provide insightful contributions to: 1) enhancing the capabilities of the specific municipality officers, 2) discussions of the specific contextual settings and frameworks for the influential activities of municipalities, and 3) learning in respect to what could be inspiring for others in respect to the first two points.

Like Flyvbjerg I thus wish to contribute specifically to the context of study, and further attempt to point at learning that could have value for other similar situations. Flyvbjerg's interest seems mainly to provide insight into the context of study, not specifically in contributing to the actual performance of the specific actors of the particular case. Conversely – as involved in the Carbon 20 project – I attempt to engage with the specific actors in terms of enhancing their performance. I thus extend Flyvbjerg's work in terms of also wishing to contribute actively to the development of the Carbon 20 project and through this the actual performance of municipal officers. In contrast to Flyvbjerg, who seems to apply a rather external observer perspective, my approach is closer to a participatory research approach in terms of actually engaging myself in the Carbon 20 project, and furthermore in also engaging the participant municipal officers in the determination of which interesting problems to study.

My formulation of the problem(s) to be studied has thus been "participant steered" – or more precisely inspired. The "participant steering" does however depart from Illeris' formulation of the concept, as I have been interacting with the municipal officer views in defining the problems of concern to be studied – not with fellow researchers (or peers as in the educational process).

The participating practitioners from the municipalities have been involved in the actual identification and formulation of the problems of interest. For the specific framing in this thesis, I as the researcher have had the final say in assessing the problems as scientific problems, although in alignment with the problems and challenges that are experienced by the participating municipalities (see more on this later)

By engaging with the participating officers and acknowledge their understandings of challenges etc. I clearly make the PhD research of societal relevance, as one of the specific tasks of the Carbon 20 is to enhance the competences of the municipalities in order to contribute positively to the socially relevant problem of climate change. I also make sure that the experiences of the officers are taken seriously and their knowledge is built upon.

Following Illeris and the tradition of the Frankfurter School, however, the research focus should go beyond this. I adhere to applying a critical perspective in terms of attempting to question the present structure of society. When analysing the specific situations and the challenges identified by the participating municipal officers I will therefore apply a critical view of the established societal frameworks and understandings that the officers act within – Illeris' "societal relevance" criteria, which actually resembles the context that Flyvbjerg also addresses.

While inspired by a critical theory focus on questioning existing societal structures, I follow Flyvbjerg's argument against the suitability of general overall theory and

thus also that such questionings of the societal structures doesn't provide for a general applicable critique. My intention with this critical perspective is to provide insightful critique and suggestions for altering the specific settings surrounding the assessed municipality actions – not to postulate that this critique is generally applicable in all given cases.

In this process of contributing actively both to the learning of the participant municipalities and providing insight into the settings for their actions, I do however find that such contributions also make more "generalised" contributions in terms of both nuancing the academic debates about local governance in respect to climate mitigation, and providing learning inspirations for other municipalities in similar situations.

After having outlined how Illeris and Flyvbjerg have been applied to forming the scientific approach in this PhD thesis and before turning attention towards the methodical implications of this, I now briefly turn focus back to the preliminary discussion of Adolphsen, Kjærsdam and Enemark with respect to the practical problem and its related "theoretical" (or conceptual) problem(s).

In the first chapter I described how different actors at national, regional and global governmental levels, companies, municipalities, NGOs etc. have begun acting on the climate change mitigation agenda. I also argued that most of the public (and academic) awareness so far has been at the national, regional and global governmental level (Kyoto, COP, EU, US etc.) or company internal actions. I also showed, however, that the municipalities have received renewed attention as central actors in respect of the actual implementation of policies related to climate change.

I have outlined the overall field of concern (the theoretical problem) as a governance perspective, with respect to the efforts of municipal actors to engage with and actively influence local companies in implementing the overall policy formulation. This governance framing relates specifically to my interest in addressing broader societal settings from a critical perspective.

I maintain this as the overall framing of the PhD thesis, but emphasise that the analyses and discussions are also seen from a learning perspective in terms of also addressing how the project and this PhD have contributed with respect to enhancing the competences of the participating municipalities and the participating officers, and how the project provides possible inspirations for other municipalities.

2.2. METHODICAL CONSIDERATIONS

Above I have outlined the scientific approach based on a combination of Illeris' problem-based research approach and Flyvbjerg's phronetic contextual approach. I indicated the main two-fold interest of the specific study, a governance perspective

and a learning perspective with the Carbon 20 project as the basis of the study. I now turn towards a discussion and explanation of the methodical consequences of this approach in respect to the specific object of research.

As Flyvbjerg emphasised, the problem-based research approach calls for an adaptive methodical approach in terms of applying the methods and knowledge from previous writings to provide valuable insight to the specific problem in focus.

As argued above I adhere to Flyvbjerg's arguments against the attempt to apply "ideal theory" in social sciences, arguing specifically that the context is central. However I do emphasis that past contributions have a role to play in contextual problem-based research and introduce "Governance" and "Practitioner Learning" as central conceptual focuses of this PhD. In addition – following both Flyvbjerg's adaptive methodical considerations and Illeris' application of interdisciplinary studies – I also use "past contributions" in the form of "theorisations", conceptualisations etc. in the specific analyses carried out. They form, however, a rather different role than "ideal theory", as they are not applied to assess the field of concern, but rather as an outline of the basic understandings, rationalities and ideas (discourses) of the field. A first step in pointing out the methodical choices is thus to go deeper into the discussion about the role of "theories", concepts and "past knowledge" within this PhD Thesis as I on one hand refer to Flyvbjerg's argument against "ideal theory" but still use different conceptualisations, "theorisations" and past knowledge.

As mentioned, the empirical base of this study is the Carbon 20 project. This forms what Flyvbjerg calls a case. I will discuss the idea of using case studies, particularly following Flyvbjerg's approach, as a method for getting close to the context and point at possible learning of broader interest in light of his argument of the "force of the example".

Contrary to Flyvbjerg's focus in his 1999 publication, where he developed his method for the specific case of the in-depth analysis of a specific (past) political planning process, in my case I am not interested in looking in depth at a specific (past) political process, but in attempting to get close to the actual contemporary practises of the participating municipal officers. This different focus and nature of the case naturally also influences the method I find useful for the specific empirical data collection in my study compared to that which Flyvbjerg has chosen to apply.

I adhere to Flyvbjerg's principle of attempting to rely on primary information sources. Contrary to Flyvbjerg, however, this is not the dechiffrement of documentary acts, but rather methods that allowed me to capture the experiences of the participating officers. My method thus departs from Flyvbjerg's agitation for an archeologically – geological assessment of specific events and their meanings from the specific acts of a given decision process. Conversely, I need methods that allow

me to get closer to the actual practise of the partitioning municipalities and the officers.

As already explained I took an active part in the Carbon 20 project including letting the officers' understanding of the context form input for the actual formulation of the problem to be studied. I will thus look more deeply into the concept of participatory research and how I apply this – including as empirical input for my assessment.

Supplementing such data, I applied qualitative interviews as one of the central means to receiving the input, perspectives and judgement of the participating officers and other actors.

While clearly not putting as much emphasis on the dechiffrement of key acts and documents as Flyvbjerg, a review of central documents in terms of both municipality action plans, and of the contextual settings for their action will also be included – focussing on the more official documents, whereas Flyvbjerg also looked into the specific underlying documents, as he was interested in the political processes leading to the decision.

THE USE OF THEORY, CONCEPTUALISATION AND PAST KNOWLEDGE

In the following section, I am going to discuss what counts as useful past knowledge, "theorisation" and conceptualisations within the tradition of problem-oriented phronetic research. The discussion will mainly build on the approach of progressive phronetic, as developed by Flyvbjerg (1999), combined with thoughts on inter- or transdisciplinary research as argued by Illeris, and will serve as a guiding framework for the research in this thesis.

My research interest (and also the focus of the participant municipalities) within the Carbon 20 project is related to the social science sphere as the focus is on the implementation of municipal strategies to influence companies to lower their emissions. While the aspect that is to be implemented – the reduction of GHG emissions – is a technical and natural science phenomenon, the main focus of the project still remains within the societal domain as it relates to municipality implementation of policies to lower the GHG emissions.

As mentioned above, Flyvbjerg seriously questions the appropriateness of using "theory" in social and human research with the same significance it has within the natural science traditions. Flyvbjerg acknowledges that several more "soft" theories have been developed and can make valuable contributions to the specific field of

study[17]. He does however argue that such "soft theories" differ significantly from his notion of "ideal theory" especially in respect to relaxing on (either or both) the general applicability and/or their ability to predict. He thus finds it very misleading to call both such phenomenon "theories". If the general applicable and predicative "approaches" are to be called "theories", he argues that other theorisations and conceptualisations should be called something else.

I basically agree with Flyvbjerg in his critique of claiming general and predicative theories (ideal theories) as valid and useful within social sciences and humanities. Equally I also find that it is misleading to name every theorisation and conceptualisation a theory in the same way as those "ideal theory" of natural science approach. I will therefore in the following use the concept "ideal theory", when talking about such natural science inspired theories, and attempt to use the concepts of "conceptualisation", "theorisations" and "learning from past experiences" when referring to more soft theorisation within the social science and humanities.

What Flyvbjerg point out is, that the integration of context is actually a prerequisites for any conceptualisations about human actions (both of the object of study and the researcher). Contrary to the validity claims within the natural "normal science", where researchers abstract from the context, human and social science research has to incorporate the context. The validity claims related to human and social science research therefore have to be very explicit, conscious and reflective of the context of the production of knowledge.

Following the guidelines for problem-oriented research based on a progressive phonetic approach and critical theory, it is however still important to build on past knowledge and experiences, as also claimed by Dewey in the qualification of the learner's personal experiences. Following critical theory and progressive phronetic research, such knowledge needs critical judgement in respect of their valuable contributions to the study in focus, for example in relation to whether the context in which they have been developed allows for any useful (meaningful) applications of concepts and learning in a new contextual setting – historical period, different geographical place and/or level (global, national, local) etc.

Furthermore, instead of framing these as THE theories used to assess the field, I, inspired by Dewey, incorporate such as past knowledge, previous learning and conceptualisations of the field.

[17] He himself, for example, looks into various contributions and attempts to provide insight into what constitutes power – also using Foucault with respect to his stand on this topic and not solely as inspiration for methodical questions.

By this I argue that such past knowledge and conceptualisation has a significant altered role for the research than the traditional science approaches. Science often starts out with more or less coherent (disciplinary) theories that direct the relevant research questions and the lenses for what is actually seen in the field of interest (e.g. formulating hypotheses that are analysed to either verify or falsify the theory).

Contrary to this (and along the same lines as Flyvbjerg's argument for applying different methods depending on the problem of focus), the problem-based research formulated by Illeris' concept of interdisciplinary studies implies that the societal problem under investigation is decisive for which knowledge; conceptualisations and previous leanings are relevant. The criteria of the relevance of past knowledge etc. in the problem-based interdisciplinary research is thus whether judged to have something valuable to add to the analysis and assessment of the specific problem of focus (similar to the US pragmatic doctrine of whatever works!). Following that, my ideal is to transcend the boundaries of the disciplines and let the specific framing of the problem be decisive regarding, which past knowledge is relevant. The point is precisely the critical outset in terms of not reproducing the ideas, concepts and understandings of the established theories and assumptions, but opposite function as the basis for bringing them into question, elaborating on them through new context-bounded studies, and indicating where they fall short in providing proper explanations.

In that respect, I interpret interdisciplinary as going beyond solely bringing disciplines together. The aim is not that two or more researchers from different disciplines (e.g. an economist, sociologist and engineer) approach a research field from within each of their disciplines and cooperate to bring the different perspectives into a common discussion – or one researcher approaches the field from within different disciplines (for such interpretation see, for example, Wallerstein, 1998). The aim is opposite to step out of and/or transcending the established disciplinary boundaries and their contextual, theoretical and paradigmatic ballast in terms of bringing new insights that even might question common assumptions. The outset is as stated above the societal problem – not a specific disciplinarily defined problem. Several researchers have attempted to make distinctions between, for example, cross-, multi-, inter-, and transdisciplinary as a gradual higher integration of different inputs from different disciplines (e.g. Stember, 1991). Following such distinction, what I argue for and attempt to apply is a transdisciplinary focus (see Baastrup et al. (1999) for more on discussions of interdisciplinary).

The six sub-analyses of Figure 3 (Chapter 5 to 10) all take their specific framing and interest in respect of the overall research questions resulting in the five sub-research questions and a specific narrowly framing of the overall research question. They all thus have some distinct characteristic and the sphere of interest also differs in the six analyses. Following the pragmatic use of "theories" or

"conceptualisations and learning of the past" as closely related to the specific problem under research, I apply different (and not necessarily coherent) "theoretical" input to the five analyses. These will build on concepts and previous learning that I find important in order to comprehend and understand the specific dynamics of the field of interest. In next Chapter I will term them as "discourses of the field", covering the more or less coherent thoughts and ideas dominating the discussion of the particular field of study. Mortensen (2000) has specifically argued that such knowledge, conceptualisations and theorisations of relevance for the specific problem of study are to be viewed more as one of the elements to be analysed rather than actual theory in the conventional use of theory (Mortensen, 2000).

As argued above I am inspired by critical theory and progressive phonetic science, and as such prescribe myself into the critical science tradition – applying a change perspective towards existing societal structure and existing paradigmatic and discursive understandings. Following this – and the problem-oriented, pragmatic approach as well – I question the ideal of "objectivity" in the (social) sciences and humanities.

As researchers we have learned to set up certain criteria about the validity and not least repeatability of a specific assessment, however such criteria does not make the outcome "objective". From a critical theory perspective, knowledge production is always based on some basic assumptions and approaches. What we can as researchers is attempt to make our assumptions and the theoretical and methodological choices conscious and explicit to the audience and to embed the context in the analysis, allowing the reader to judge the grounds on which the findings are made. This is exactly what this chapter attempts to do.

Between this outline of the basic critical theoretical (epistemological) standpoints and the specific "past conceptualisations of the field" (discourses) applied in the six sub-analyses analyses of the theories, concepts and understandings that dominate the context of interest in the fields, there is however a gap, as not all these concepts and theories of the field necessarily follow the above outline of my scientific standpoints, as they serve a different role.

Bridging this gap, in next chapter I will develop an overall conceptual framework for the research questions, that brings the six sub-analyses into a common overall coherent picture of how the assessments are also linked together in terms of theoretical and conceptual links. As already indicated this will depart from the discussions about governance.

As already argued, the conceptual framework presented in the next chapter is not to be understood as the theoretical outset for the empirical data collection; it is not to be considered as "ideal theory" of governing. Quite opposite, this governance

discussion is an attempt to iteratively bring relevant past contributions into the current overall analyses of the PhD thesis. The framework has been developed iteratively in interaction with the context of study. The framework is thus more the result of a dialectical process to comprehend the actual practical problems pointed at by the municipalities and my own further assessment of that in respect to past knowledge. It is more an ex-post attempt to make an overall coherent framework of the empirical data and various assessments of the discussions and problems addressed than the theoretical ex-ante basis for carrying out the analyses.

CASE-BASED RESEARCH

As already presented, Flyvbjerg argues strongly for the use of case study as an appropriate method to get closer to the context and particularity of the research. In recent decades the interest in case study research has increased within the social sciences pointing exactly at the appropriate of case studies for research into complex social topics.

> … the distinctive need for case studies arises out of the desire to understand complex social phenomena. In brief, the case study method allows investigators to retain the holistic and meaningful characteristics of real-life events – such as individual life cycles, small group behaviour, organizational and managerial processes, neighbourhood challenges, school performance, international relations, and the mature of industries" (Yin, 2009: 4).

Yin (2009) equal to Flyvbjerg also argues for a multifaceted approach in research, viewing case studies as one out of several possible methodical choices. He too argues for the value of combining various methods, and further also opposes some of the common arguments against case studies (Yin, 2009).

I anyhow still find that his approach towards case studies is reminiscent of his basis in the more classical science tradition. In spite of his argument for the case study as an appropriate method for gaining insight into non-controllable events (contrary to laboratory experiments), it seems that his objective with the book is precisely an attempt to take some kind of research control of the knowledge obtaining process using the ideals of laboratory experiments. While as researcher I of course have some preliminary ideas and interest in the field of study that guides my research – also in case studies – I find that Yin's approach leaves too little room for actually adapting focus and approach to the specific of the field of study in terms of engaging with the specific problems as experienced by the actors of the case. This is e.g. apparent in his emphasis on a preliminary literature review as the departure for formulating the relevant question to be researched instead of engaging with the actual challenges of the actors experienced in the case and field of study (Yin, 2009).

As argued above, I conversely have tried to engage myself with the field of study and let inputs from the key participant actors have a significant effect on the chosen focus of the research, which then directs the literature reviews of past knowledge and conceptualisations relevant to look into. While I also used this participatory approach to distinguish my approach from that of Flyvbjerg, I still find that he - compared to Yin – attempt to get closer to the actual particularity of the context under study.

In the following, I will therefore present Flyvbjerg's approach to the case study and his arguments for case studies as a valuable method in a progressive phronetic research to get familiar with the particularity central for actual add insight on the societal processes. This also includes what he frames as the "force of the example" (Eksemples magt) in terms of how even single cases still can add valuable insight and learning relevant in a larger context (Flyvbjerg, 1999; Flyvbjerg, 2006: 228).

Flyvbjerg has in debates with other social science researchers (e.g. Stanford researchers) developed an argument for the case study based on what he describes as the five misunderstandings of the case study (see Flyvbjerg, 1999; Flyvbjerg, 2006):

- Misunderstanding 1: General theoretical (context independent) knowledge is more valuable and truthful than concrete, particular, practical and context-dependent knowledge;
- Misunderstanding 2: It's not possible to generalise knowledge based on a single case, which is why a case study cannot contribute to building scientific knowledge
- Misunderstanding 3: A case study is most useful to generate hypotheses as the first step in an integrated research strategy, while other methods are more useful to test the hypothesis and the theories
- Misunderstanding 4: The case study has a tendency to verify the researcher's preconceived ideas and assumptions
- Misunderstanding 5: It is difficult to draw conclusions about specific case studies and to generalise and conceptualise the knowledge.

As Flyvbjerg argues these five misunderstandings of the case study within the social science and humanities relate to the dominant paradigm of natural science being used to judge case studies. In contrast, Flyvbjerg argues that the case study is a proper method for the social sciences, when aiming for the science (knowledge) of the particular and contextual.

Case studies are a way to gain insights into the context-specific knowledge of human actions. A single case does not represent the average of the data under study, however an in depth understanding of the mechanisms of interest in the case will often provide valuable knowledge for learning about similar situations. In that sense

it is not the number of cases that is important for the value of the knowledge obtained, but the character of the cases, and how the cases are worked with. As such the case study can be used in all phases of a study – to inspire and clarify the problem analysis, to inform the research, and to conceptualise the learning and knowledge.

A case study brings the researcher into close relationship with the practice of the actors of the case. Depending on the researcher's methods by which to listen and learn from the case, they can transcend their original preconceived ideas.

Finally, the researcher needs to be aware that any "generalisation" of a case study has to be modest, and very specific on the political, social and cultural contextual elements that are embedded in the research.

In the following I discuss the character of the Carbon 20 project as a case study. This discussion is related to the kind of insights and knowledge that can be produced based on the case c.f. Flyvbjerg's "the force of examples".

Flyvbjerg talks about a strategic selection of relevant cases for research, and how to find these cases. I agree that it is – if possible[18] - important to make some preliminary considerations about the expected values and research perspectives for the selection of cases, deciding which partners to involve in research projects, and/or the decision to join (or co-develop) projects centred on (a) particular case(s). However, I find that Flyvbjerg's emphasis on selection criteria as important for the "case(s)" exemplarity is not entirely true to his own progressive phronetic research ideal and his emphasis on focussing on the particular and contextual. When engaging with the particular case(s), preliminary expectations will likely need adjustments in several different ways. The character of the case can thus change in respect to such preliminary selection criteria, whereas these pre-study selection criteria might need post-study revision[19]. I actually believe that most cases would be

[18] In real life research situations the researcher does not necessarily have the privilege of picking and choosing from various cases. Several aspects will often restrict them. This could e.g. relates to: the question of willingness to participate; circumstances and opportunities; personal contacts etc. Equally the researcher may also inter an on-going project and or the projects follow in continuing of previous collaborations. Such aspects are often crucial in deciding which actors and cases to base the research on. The use of pre-selection criteria is thereby rather idealised. Neergaard (2007) also add a selection criteria of "opportunistic selection" to catch such situations.

[19] Some of the reasons for this focus on selection criteria instead of evaluation criteria might relate to the fact that he wrote against more traditional science approaches (cf. his five misunderstandings). This might also explain his inclusion of sample criteria that clearly resembles something to which more traditional science approaches could relate

useful as the basis for gaining valuable insight in respect to the problems of that case(s). The challenge might be to determine how to broaden the contribution.

I therefore questioning this "ideal" selection of cases, but acknowledge the valuable of discussing the character of the given case in respect to judging its relevance for other situations – both preliminary in the selection of the cases, but equally important to adapt depending on the particular insight obtain from the case. For such discussion of the character of a given case I find Flyvbjerg selection criteria useful – at least for his informative cases. I do however treat such more as post-study "evaluation" criteria rather than pre-study selection criteria.

Flyvbjerg (1999: 150) has listed different criteria in respect to both informative selection and random selection. He lists the following selection criteria[20] (see Table 1).

[20] Neergaard (2007) has attempted to expand Flyvberg's selection criteria by gather several diverse contributions for setting up such selection criteria. She has both added several different criteria, but also removed one of Flyvbjerg's criterions. She further renamed Flyvbjerg's "information oriented selection" approach to "formålsbestemt udvælgelse" (purposive selection). I find her idea of purposive selection appealing, but I have some difficulties in following her framing of the selection criteria. Several of her criteria seem to be a specification of some of Flyvbjerg's categories, but still figure at same "level" as the criteria adopted from Flyvbjerg. For my discussion of Carbon 20 as a case, I do not find that the additional criteria add that much. She does add the criterion of "opportunistic selection" to capture some of the actual reality of the way cases often is selected. She specifically recommend not to follow this selection strategy (alone), but at least acknowledge it as a relevant starting point, that can be adjusted by selecting additional cases (Neergaard, 2007).

Table 1 – Selection criteria for case studies (Flyvbjerg, 2000: 230)

A. Random selection	*To avoid systematic biases in the sample. The sample's size is decisive for generalisation.*
1. Random sample	To achieve a representative sample that allows for generalisation for the entire population.
2. Stratified sample	To generalise for specially selected subgroups within the population.
B. Information oriented selection	*To maximise the utility of information from small samples and single cases. Cases are selected on the basis of expectations about their information content.*
1. Extreme/deviant cases	To obtain information on unusual cases, which can be especially problematic or especially good in a more closely defined sense.
2. Maximum variation cases	To obtain information about the significance of various circumstances for case process and outcome (e.g., three to four cases that are very different on one dimension: size, form of organisation, location, budget).
3. Critical cases	To achieve information that permits logical deductions of the type, "If this is (not) valid for this case, then it applies to all (no) cases."
4. Paradigmatic cases	To develop a metaphor or establish a school for the domain that the case concerns.

The Carbon 20 project, as the case in this PhD thesis, clearly plays the role of "an information rich case". What I am interested in is not attempting to make any generalisations about how municipalities everywhere could or should act to influence companies, but to obtain specific contextual knowledge of the particular case, which will hopefully bring about learning and insights that have utility for both the participating municipalities and the specific context, but further also provide relevant experiences and input for similar situations.

I will furthermore characterise it as an extreme/deviant case. The project is supported by the EU Life+ programme. Not all municipalities have the network or the capacity to participate in a EU project. The Carbon 20 project is furthermore also led (or steered) by the municipality interest, and the municipalities have prioritised to engage in the project and to invest themselves. This makes the case "deviant", as most (Danish) municipalities do not have such capacity.

As also mentioned in the introduction, the participating municipalities have mutually committed themselves to green targets through the partnership constellation of "Green Cities"[21]. This implies that the participating municipalities can be expected to prioritise the green agenda beyond that of other municipalities. This underscores the case as an "extreme" case. For some of the specific assessments, it might even have the character of a "critical" case, if, for example, it is found that even such "frontrunner" green municipalities have difficulties adhering to the green agenda.

Often, when developing new strategies for implementation, it is important to build on the most ambitious and advanced cases in order to learn the most, which can later be spread to the other municipalities. This has been the objective of the Carbon 20 project, and as such this case is exemplary as being an "extreme" case or even "paradigmatic" in terms of providing advices to follow.

When we take a closer look at the case, we can see that it altogether involves seven municipalities. This provides an opportunity to determine whether there is some "variation"[22] within the case.

Neergaard (2007) adds several variation criteria in addition to Flyvbjerg's "maximum". For me it is not quite clear what the purpose is of such further distinctions is, but neither what the specific purpose of Flyvbjerg's inclusion of Maximum before the variation. What I find important is how the case(s) vary both from each other and from other cases, so that any reader has the option to judge on which terms the knowledge is based and thus whether it is relevant for their interest or context. Neergaard (2007) specifically name this "analogue generalisation" in terms of providing insight that might be useful for other similar cases. She argues that for such analogue generalisation the judgement about possible utility is not necessarily up to the researcher, but the reader. The task of the researcher is to make such judgement possible (Neergaard, 2007).

[21] As also mentioned Næstved is not part of this, but was a candidate at the time of the application for Carbon 20 to the EU Life+

[22] I have deliberately chosen to leave out the "Maximum" as it is not quite clear to me what Flyvbjerg actually means by adding this.

In the following, I'm going to briefly present the seven municipalities.

The participating municipalities are quite diverse, including: the main city of Copenhagen, the capital of Denmark; three suburb municipalities of Copenhagen, respective Albertslund, Allerød and Ballerup; and three (bigger) middle-sized municipalities of Herning, Kolding and Næstved each consisting of a city centre, "suburbs" neighbourhood, and rural areas and smaller villages.

Table 2 - Inhabitant in the Carbon 20 municipalities (Danmarks Statistik, 2014a)

Copenhagen	Allerød	Albertslund	Ballerup	Herning	Kolding	Næstved
572376	24201	27780	48477	86813	90257	81486

Copenhagen, with its almost 600,000 residents, is the largest municipality in Denmark. The next in line are Aarhus, Aalborg and Odense with around 200,000-330,000 inhabitants (Danmarks Statistik, 2014b).

The Copenhagen municipality only includes half the population of greater Copenhagen's more than 1 million inhabitants, whereas the rest are inhabitants of suburban municipalities. As opposed to Aarhus, Aalborg and Odense, the Copenhagen municipality thus includes only urban areas, whereas the others also include suburbs and even rural areas.

The suburban municipalities of Copenhagen vary in size ranging from 20-30.000 inhabitants to 75.000 inhabitants. Allerød and Albertslund are some of the smallest with between 20-30,000 inhabitants, whereas Ballerup is in the larger end with its almost 50,000. The majority of the suburban municipalities of Copenhagen are in the range – 30-50,000 (Danmarks Statistik, 2014b).

The three middle-sized cities (Herning, Kolding and Næstved) belong to a bigger group of such towns ranging in seize from 40.000 to 115.000, with several around same seize as those three municipalities participating in Carbon 20 (ibid).

The municipalities participating in the Carbon 20 project cover thus a broad variety of the various sizes and types of municipalities present in Denmark, although representation of the most remote (and smallest) rural municipalities is lacking.

I do not, as such, systematically discuss these differences between the municipalities in this thesis, but I highlight it where I have found it to be of significance.

PARTICIPATORY RESEARCH

As already explained I participated actively in the Carbon 20 project. In addition to engaging myself in the course of the project, I have let the input from the participating municipalities (officers) co-steer the direction of the research.

Above I have argued for some of this in respect to discussing Illeris. However, participatory research is a tradition on its own that actively concerns engaging the "objects" of a study as "subjects" who also have an interest in the direction and outcome of the study. I will therefore in the following discuss my approach in respect to this tradition.

Bergold & Thomas (2012) have, for example, in an introductory text to a special issue of FQS on "Participatory Qualitative Research" presented an overview of some of the main methodological considerations of this research tradition.

Bergold and Thomas (2012) stress:

> Participatory research methods are geared towards planning and conducting the research process with those people whose life-world and meaningful actions are under study. Consequently, this means that the aim of the inquiry and the research questions develop out of the convergence of two perspectives—that of science and of practice (…) In the best case, both sides benefit from the research process (…). Participatory research can be regarded as a methodology that argues in favour of the possibility, the significance, and the usefulness of involving research partners in the knowledge-production process (Bergold & Thomas 2012: 1).

For my study this implies that the participants in the project indeed have had a great deal of influence in terms of the specific framing of the interest – both in terms of the specific activities, but also in terms of the direction of the research. They have contributed as participants in respect to framing what they conceive as the challenges and problems to address.

The character of this participatory steering for by research differs as already explained from Illeris' approach, but also from the approach advocated by Bergold and Thomas (2012).

In Illeris, the people engaged all take the perspective of the researcher (students) both observing and being interested in the object of study from a research perspective. Bergold and Thomas (2012) argue for including the perspective of the practitioners as partners in the research process. They argue for involving them (or some of them) directly as co-researchers throughout the whole research project –

not just the steering and pointing out the field of interest as directional for the research process, but also the further collecting, processing and analysing of the data (ibid).

This differs from my approach. I still make a distinction between two quite different roles and interest in the projects and the results of my PhD: That of the practitioners in the Carbon 20 project and "informant" for my PhD, vs that of myself as researcher. Some of especially the collecting of the more quantitative monitoring data of the Carbon 20 project (not specifically used in this PhD thesis) has involved the officers, but not to such a degree that I would call it co-researchers.

The Carbon 20 project is a Green City project. It is the municipalities that are the formal project owners, and have taken the lead in formulating the projects and the overall tasks. The project could in principal have been conducted without it also being a research project. Aalborg University (AAU) has been a partner in the project and attached I as PhD student to the project and thereby bringing in a research perspective to the project as well.

The Carbon 20 project deviate from many traditional research projects; or classical research settings in the wording of Bergold and Thomas. In classical scientific knowledge production within universities, the research questions are generally research-driven in terms of being formulated solely by the researchers (as the privilege of free research). The participatory research approach of Bergold and Thomas (2012) deviate from this by involving the practitioners as co-researchers in the process. The Carbon 20 project further deviates in actually being a practical driven project, but where I as researcher try to build on this to make it into a research project.

In the Carbon 20 project, the initial project proposals was mainly formulated by (or on behalf of) the municipalities and were primarily directed towards enhancing their competences and reaching their targets for GHG reductions. Likewise the municipalities have had a significant say in the actual development of the project with the municipal of Albertslund as the official project owner.

My point of departure for the research has been to engage in a dialogue with the actors from the municipalities and to comprehend what they perceive to be of concern. The focus of my research is thereby decided based on this engaging with the case and comprehension of the municipalities practice.

Borrowing a term from Bergold and Thomas, the Carbon 20 project is clearly a practitioner-driven project as contrast to an academically driven project. Contrary to Bergold & Thomas' (2012) concept of a co-research project, this has not been the case here. I reserve it as my task to decide on the final research questions of interest, research design and applied method etc., but depart from the experiences

obtained through the practitioner-driven Carbon 20 project. The Carbon 20 project is first and foremost concerned with the actual practice of the municipal officers – not as research objects, but for enhancing the competence of the municipalities and obtaining actual GHG reductions. I build my research perspective on top of this. They are the prime agents in directing the Carbon 20 project, which thus sets the direction of my research. I as participant, and AAU as partner, in the project have naturally influenced the direction in terms of bringing in different perspectives in the discussions.

I make however a clear distinction between two main roles: 1) The individual/organisational learning, particularly of the participant municipalities; and 2) The *researcher's (my)* role in attempting to encourage some overall learning and knowledge relevant in a larger context.

For the municipalities (the officers), the main objectives (in addition to achieve actual GHG emission savings) have been to enhance their ability (competences) to encourage changes among the local companies with respect to GHG emission reduction. My perspectives have been double. On one hand I have been involved as actor actively attempting to contribute to the – municipal driven – objective with the project. On the other hand I also took a research perspective of reflecting on the mutual learning throughout the projects in terms of pointing at any relevant experiences to extract from the project in respect to: affecting the specific context of the assessments carried out; point at experiences and learning that could be relevant for others; as well as insight relevant in respect to the existing "academia" knowledge of this field.

Bergold & Thomas (2012) address the learning perspective and stress the need for all partners to engage in various reflective and reflexive learning processes. They especially point out that those from practice that are engaged as co-researchers necessitate reflexive reflections of their role (Bergold & Thomas, 2012). As mentioned, the participants in the Carbon 20 project are not engaged as co-researchers. The learning related to the practitioners of Carbon 20 is to enhance their competences related to their practises – not to become co-researchers. I as researcher have however also engaged in a learning process in terms of learning from their learning.

I will try to elaborate on the mutually reflexive reflective learning processes of both the participating practitioners (municipal officers) and myself as researcher through the concepts Double loop, single loop - and deutero-learning as well as Reflective Practitioner introduced by respective Schön and Argyris (1978) and Schön (1983).

The Carbon 20 project has, connected to the task of enhancing the competences of the participant municipal officers, introduced the concept of a "reflective dialogue partner" as a lens for discussing the role of the officers in influencing the climate

and environmental agenda of the companies (see chapter 9). This concept builds on Schöns' concept of a reflective practitioner, which involves a practitioner who reflects on the underlying assumptions and principles for their action and consequently adapts the applied strategy. Schöns "Reflective Practitioner" succeeds his joint work with Argyris from 1978, in which they introduce the concepts of "single loop-leaning" and "double loop-learning" (Argyris and Schön, 1978). In this they further introduce the concept of "deutero-learning" in terms of learning how to learn, or meta-learning (Schön and Argyris, 1978; Tosey et al., 2012).

As mentioned the Carbon 20 project includes a specific objectives of enhancing the competences of the participants municipality officers. Learning is an important focus of interest in both the Carbon 20 project and in my research on it.

One of the AAU tasks in the Carbon 20 project has been to guide the officers in learning how to engage in double loop learning as a "reflective dialogue partner". Using the wording of Argyris and Schön AAU has thus engaged in tutoring the officers "deutero-learning". Chapter 9 will go more into depth about some of this.

I have been part of this project and also part of the process of tutoring the officers to learn how to be reflective dialogue partners. I have participated in the various specific discussions about this as well as have participated in some specific interactions between the municipalities and companies – one of the "contributing" parts of this participatory research. However as the scientist I am also trying to reflect on their experiences in becoming reflective dialogue partners in terms of my specific research interest and answering my specific research questions. I am trying to learn from their double-loop learning. Extending on the wording of Argyris and Schön, I frame this as "Triple Loop leaning".

Others have also attempted to add a third loop to Argyris and Schöns' concepts either analogous to Argyris and Schöns' "deutero-learning" or as an additional (superior) loop in terms of questioning even more deeply the rationale and norms for a given action - see Tosey et al. (2012) for a critical review of previous uses of

the term. My conceptualisation of a third loop departs from such earlier attempts[23] as the centre of the loop is altered from the practitioner's perspective to a (2nd part) research perspective that attempts to doing research on top of their learning – to reflect on their reflections.

My objective with the use of the "learning loop" and "reflection" in this discussion of participatory research is specifically to point out that my engagement in such a participatory research project indeed relies on learning from participating in such a project.

Returning to Bergold and Thomas (2012), they argue precisely that the whole objective of participatory research is to engage practitioners actively so as to bring in their contextual knowledge of the field of interest into the research carried out.

> What counts is that they bring their experiences, their everyday knowledge, and their ability into the research process and thereby gain new perspectives and insights. The difference between the academic worldview and that of the research partners from the field is actually an asset, which must be exploited in the exploration process (…). It enables all participants to acquire new roles and tasks that differ clearly from those of "classical" research (Bergold and Thomas, 2012: 9).

This applies in terms of engaging practitioners as co-researchers in a research project, but it also applies to my approach where, as researcher, I am stepping into practitioner-driven projects in order to learn from their experiences.

This also implies, however, that the classical research approach to the field is altered from a typical subject-object view, to a subject-to-subject relationship, treating them as knowing subjects and not just as informants. This again requires a trusting relationship and the establishment of "a safe space" for disclosing personal views, opinions and experiences of the situation:

[23] The objective here is not to engage in a discussion of these attempts to add a third loop (for such see Tosey et al, 2012), but rather to introduce a third loop as a new significantly altered perspective on the learning where the centre of the loop is altered to an external observer. My objective is to use the loop reference to point out that I, as a researcher engaged in participatory research, indeed rely on their learning from participating in such a project and thus the links between the different agendas in participatory research. However, I do find that previous attempts to introduce a third loop seem rather constructed. I have difficulty seeing the added value of these additional loops. Argyris and Schön's double loop already includes the questioning of the underlying concepts and principles, whereas I have difficulties following the adding of a third even deeper loop. Equally Argyris and Schön themselves interpret deutero-learning as something quite different and separate from the loop learning processes.

> Participatory research requires a great willingness on the part of participants to disclose their personal views of the situation, their own opinions and experiences. In everyday life, such openness is displayed towards good and trusted friends, but hardly in institutional settings or towards strangers (…). However, participatory research specifically seeks these dissenting views; they are essential for the process of knowledge production because they promise a new and different take on the subject under study, and thereby enable the discovery of new aspects. (…) In order to facilitate sufficient openness, a "safe space" is needed, in which the participants can be confident that their utterances will not be used against them, and that they will not suffer any disadvantages if they express critical or dissenting opinions (Bergold and Thomas, 2012: 4).

The Carbon 20 project has run for three years with almost monthly project meetings and various additional professional arrangements - several also combined with social activities for the various partners. On top of this I have conducted several rounds of face-to-face interviews with the local project leaders of the municipalities and also participated in some of their interactions with companies. In one of the municipalities – Allerød – I had office space for half a year. I believe that along the way we developed a trustworthy and familiar "safe space" and I did my best to be true to this trust, when using the collected data and retrieved information.

In respect to generating (collecting) data for the research from such participatory research approaches, Bergold and Thomas argue – similar to Flyvbjerg – for applying a range of different methods, depending on the specific focus and character of enquiry. Bergold and Thomas further stress that all such interactions in principle are to be considered data for the research:

> The range of methods to be found in the literature [on participatory research] is very broad and depends greatly on the research field and the research partners in question. In our view, therefore, it makes little sense to standardize methods of data collection. Rather, it is necessary to follow the Glaserian [Grounded Theory] dictum: "All is data" (Bergold & Thomas, 2012: 13)

Following this grounded theory dictum of "all is data" I can indeed recognise that such a participatory research approach generates a lot of data that can potentially be of importance for the research. In all the above briefly mentioned activities of Carbon 20, and having office space in one of the municipalities, I was indeed constantly confronted with potential information of relevance for the research focus. Some could immediately be seen as directly relevant, some proved relevant or irrelevant later on, while some formed directions for later, more specific data collection methods such as qualitative interviews. For several of the more "official"

project meetings and activities official summaries/resumes were produced. I have attempted to supplement these with my own notes and resumes of observations and conversations throughout the whole process. I prioritised taking notes from meetings and arrangements covering topics of special interest and focus and/or situations where no formal summary was produced – see Appendix A) for a list of my own collected qualitative data.

Broadening the outline of activities already mentioned, as participant in the Carbon 20 project, I took part in a several different activities providing input for my research:

- Almost monthly overall progress and decision meetings between all active participants (project meetings) and later in the process also smaller intermediate working meetings
- Various preparation meetings for different activities within the project
- Some of the steering meetings of the project owners
- Specific progress meetings at the different municipal partners,
- Specific interactions between the municipalities and companies
- Specific sessions to enhance the competences and learning process of the participating municipal officers
- A specific target addressing a facilitated exchange of experience on the green growth agenda
- Conferences and workshops including also interactions with on-going similar Danish projects (e.g. NBE, project Zero, Klimaklar, Miljøforum Fyn; klimakommune)

Discussions in relation to these activities form the input and basic understanding of this PhD thesis and are also used as empirical input to some extent as a supplement to the more specific data collected through interviews.

As mentioned I had office space for six months in one of the participating municipalities (Allerød). From this "stay" I have some more specific input from their daily life and practise. During this period I talked to a range of different officers within the municipality, mainly on an ad-hoc basis. I have taken some notes on these discussions, and also conducted a few arranged interviews that were recorded and transcribed.. I was furthermore actively involved in several of their activities, including the work on how to continue the project after termination of the Carbon 20 project and external funding from the EU. Again this data forms background understanding whereas far from all of the insight have been adequately reported in notes. Some elements have howeve also been used more directly.

AAU has been a partner in the project. The task of AAU was centred on:

- Yearly (three in total) monitoring of the progress and experiences obtained during the project
- Overall responsibility for facilitating the innovation processes
- Writing up the experiences from the green growth exchange of experiences
- Orchestrating the enhancement of the officers' abilities, skills and competences (the deuteron-learning)

As part of the PhD project, I have been engaged in these tasks – some as the core responsible, whereas other only involved.

I was the primary person responsible for the yearly monitoring of the project. In total three monitoring reports were written in terms of the intermediate status of the project after 2011 and 2012, and a final evaluation after the last year (2013) (AAU, 2012; 2013a; 2014). As mentioned I participated in several of the progress meetings that the overall project manager had with several of the municipalities and took my own notes from these. I carried out specific monitoring interviews with the officers from each of the participating seven municipalities on several occasions. Over 18 qualitative oral interviews were conducted with the participating officers from the municipalities, consisting of single face-to-face interviews, focus group interviews and combinations thereof (see next subsection). In addition a preliminary and a final qualitative questionnaire were send to the local officers in charge of the project.

I have contributed actively to all the other AAU tasks, which will form empirical data in this PhD, but not as core responsible. These have also been reported separately and are available at www.carbon20.dk/ (Gate 21, n.d.-d).

QUALITATIVE INTERVIEWS

I have conducted several qualitative interviews with the participating officers as part of the monitoring processes in the Carbon 20 project. Supplementing these interviews I also conducted interviews with several other actors with different roles ranging from other participants in the project, such as companies and energy consultants, to actors influencing the contextual settings surrounding the project, such as the Danish Environmental Agency (Danish EPA), and experts within the field. I have equally also interview actors from some of the similar on-going projects.

Before going deeper into a discussion of how I have conducted and processed these interviews, I first present Nigel King's (1994) considerations on the qualitative research interview. Nigel King argues that a qualitative research interview is an interview with the purpose of gathering descriptions of the life-world of the interviewee with respect to interpreting the meaning of the described phenomena. The goal is not to obtain quantifiable responses, but to gain insight into how the

interviewees perceive the research topic and to understand the reasoning behind their perspectives. He adds that qualitative research interviews can include a broad focus on the interviewees' whole-life-world (ethnographic) or a narrow focus on particular topics and how they are perceived and understood. Similarly they can vary from being relatively spontaneous and unstructured discussions as part of participatory observation research, to using quite detailed, but still flexible and open interview guides (King, 1994). Equal to Bergold and Thomas, King also emphasises that a key element of qualitative research interviews is to include the interviewee as a participant in the research (subject) rather than reducing them to research "objects" (Ibid).

King (1994) distinguishes between three types of research interviews (ibid):

1. The structured research interview, which equally could be conducted through questionnaires, where the interest primary is to gain factual (even quantifiable) data through asking the same questions to several respondents (interviewees)

2. The full qualitative research interview focussing on the meaning of particular phenomena of the interviewees (participants).

3. A third type that lies somewhere in between, with some structure imposed, but still open-ended – he calls them 'structured open response interviews' where the focus tends to be on factual information and general evaluation comments without exploring deeper layers of meaning. He emphasis that such are not structured enough to allow statistical analysis and testing of a hypothesis, but neither flexible and responsive enough to go beyond surface meanings into more etnografic understanding of the interviewees world view.

When providing guiding for the full qualitative research interview King emphasis the value of preparing a detailed interview guide (especially for preparation and as notes for keeping the interview focused on relevant topics of the research agenda). The distinction between the two latter of the above listening is thus somewhat blurred. Apparently it mainly concerns whether to solely rely on very open-ended questions or whether also to use more direct questions that address issues specifically.

King (1994) further emphasises that in a qualitative research interview one should aim to record and transcribe the whole text, as it is critical to be very focused during the interview, but also to get the whole picture of the nuances of the response when interpreting the interviews. Conversely, it will often be easy in the structured interview to sit and fill in the answers to the interview (opinion and market preference pull etc.). If recording and transcription is not possible, he recommends

taking brief notes and then as fast as possible sitting down a make a summary and not using too much time during the interview to stop to write the full answers. It is difficult to conduct the interview and take extended notes at the same time (Ibid).

The overall setting of the interview will, in my view, of course differ according to the research field and research agenda. There can be several different research objectives (problem formulations) within the same research field, and the design of the interview will depend on the specific focus in terms of whether one is interested in getting their conscious responses and opinions on a given topic, or if one wants to interpret the specific words used, the unspoken and unconscious behaviour etc. In other words whether: one is going to use the content of what the interviewees are asked about, or one is interesting in also interpreting according to specific ways the interviewee are acting. Such different interest provides different requirement for the qualitative research interview.

Depending on the focus, it will sometimes be useful to ask more direct questions in order to, for example, "provoke" a reaction or comment about specific debates of interest.

As mentioned above I undertook several rounds of interviews with the participant officers as the main informants –knowing subjects – supplemented with interviews of other actors. I used diverse combinations of King's overall types and approaches to such qualitative research interviews. Generally the focus was mainly on the particular topics of interest in terms of how they perceived and understood the topic of interest in the interview, and not as such their whole world view (ethnographic).

At the beginning of the project, the local project leaders (the officer in charge in each of the municipalities) filled out a preliminary qualitative questionnaire in order to provide a starting picture for the various municipality experiences with respect to facilitating companies on a voluntary basis – what properly would resemble Kings category 1 of the above listening.

The focus of the interviews to the first monitoring report was on the municipalities' overall experiences so far with respect to, for example, their view of options to include energy etc. as part of their general inspection activities, the process of engaging the energy consultants, which activities they specifically carried out, etc.

At the majority of the municipalities, the interviews were conducted as focus-group interviews with all the participating officers from that municipality. At a few of the municipalities the interview were solely with the involved local project leader. Before the interviews, an interview guide was prepared, structured around specific topics and including draft questions of interest. During the interview I generally let the conversation flow and allowed it to take several different directions. The interview guide was (just) used to ensure that I included the topics of interest and to

find inspiration for questions if the interview was not smooth. During the interview I took extensive notes following the structure of the interview guide, but also on any other topics addressed. I also recorded the interviews, but primarily based the summaries on the notes and only listened to passages in terms of getting the content right. This means that these summaries are focused on the content of what was said – not the specific wording.

The interviews for the second monitoring report specifically addressed the progress of each of the participating companies. The officers were, for example, asked about the status of each of the companies in respect to provided screenings, adopting action plans and their implementation, and whether they had encountered challenges and how these had been addressed. Contrary to the interviews before the first monitoring report, these interviews were primary one-to-one interviews with the local project manager. In one municipality I did also for the second round conduct a focus-group interview, and in another municipality the one-to-one interview were carried out with each of the officers involved (having also taking turn to be the local project manager).

In contrast to the first round of interviews, I didn't prepare a specific detailed interview guide. The interviews did, as mentioned, address the status of each of the participating companies within the municipality, and this functioned as the structure of the interviews. The conversations were managed so as to leave plenty of room and flexibility to follow emerging aspects of interest including following up on topics discussed during the first round of interviews. The interviews were recorded and more or less transcribed allowing capture the more specific wording used.

For the final evaluation of the project, the local project managers of the seven participating municipalities answered a questionnaire with open-ended qualitative questions. A pool of questions was designed to allow the officers to reflect on the process for each of the participating companies. This included specific questions about the process and progress for each company including specific challenges encountered; questions on the officers' role as facilitator; as well as the officers overall perspectives of challenges and learning to bring forward from the project. The focus of this questionnaire was thus double (or triple). To get the municipal officers to reflect on their learning and interactions, and collect specific information for the monitoring process (as well as this PhD).

In addition to these interviews some supplementing telephone interviews were conducted with a few of the officers the specific topics of their experiences cooperating with the energy consultants.

Complementing the interviews of the participating officers, several others actors were also interviewed. These included:

1) An interview with an employee at the Danish Environmental Protection Agency that specifically targeted: his perception of the legal basis and possibilities to address climate and energy as part of permitting, monitoring and inspection activities, his view and response to the municipal officer perceptions of constraints on this, and the status of any coming changes and their relationship to the EU framework. The interview was again semi-structured around a prime subject of interest, but still open to follow any emerging aspect of interest. The interview was extensively referenced in the summary (after listening to passages from the recording). Subsidiary to the interview there was further mail correspondence with several persons from the Danish EPA in respect to whether or not energy was addressed in the Danish Environmental Protection Act and the possibility of addressing energy in a new requirement to conduct "campaign" inspection.
2) Interviews with four of the participating energy consultants. One directly face-to-face interview with a semi structured interview guide prepared in advance. One ad-hoc arranged interview as an extension of participating in a screening of one of the participating companies, and two telephone interviews on some narrow topics related to the general energy screening offers and participation in Carbon 20. For each, an extensive summary was made. Only the first were recorded and summery based on the listening of it.
3) Eight companies were also interview in extension of participation at the municipalities (primary Allerøds) follow-up meetings with them. The interviews were on a rather ad-hoc basis without any prepared interview guide, but centred on the experiences of participating in such a project. I chose not to record these interviews as judge this could compromise the companies willingness to take part, but made extensive summaries shortly afterwards.
4) I also conducted expert interviews to gather more background knowledge especially in respect of energy saving.
5) I further conducted telephone interviews with represents of the similar projects of Project Zero and Klimaklar as well as more informal conversations with various actors from the NBE project in terms of both the involved colleagues at AAU, the central environmental officer from the municipality as well as the Environmental director at Aalborg Kommune, Michael Damm. Most of the latter is only reported in notes not made electronically available, however I also had access to a student project including extensive interview with Michael Damm (Ozimek, 2013).

Appendix A) is an overview of the majority of the empirical data collected throughout this PhD and where the summaries, transcriptions and notes (my notes and not the official taken) from interviews, conversations and meetings are made electronically available in the provided CD (primarily available for the Assessment Committee and only as the raw un-proofread Danish transcripts, notes etc.). As this

list indicates, those referred to above are just the main input. Furthermore far from all notes have been made electronically available, whereas this list is not even complete.

DOCUMENTARY REVIEW

In addition to this oral input I have also carried out documentary reviews for this PhD thesis (and the papers).

As argued earlier my case is related to a contemporary praxis and thus different from Flyvbjerg's case focused on dechiffrement of a past political planning decision. This naturally alters the methodical approach significantly. As mentioned I therefore haven't put as much emphasis on the archaeological and geological dechiffrement of the specific course of event and documents. In several of the chapter (e.g. 6, 7 and 8) I do apply a historic perspective of the current formation of the governmentally constituted regulatory frameworks setting the boundaries for the municipality practice (see next chapter) – the "History of the Present" to use a Foucauldian term. The history that I look into is however both more limited in scope and length than that which Foucault is interested in. While not totally true to Foucault's or Flyvbjerg's archaeological-geological methodical directions, I have attempted to look at the current constituted regulatory set-up by presenting documents judged important for how to interpret the current framework. This has involved analysing formal and legal texts (laws, statutory orders, guidelines for lower level government), political documents in terms of evaluations and recommendations and other similar documents, as well as literature reviews, so as to understand the discourses of these documents.

I have also reviewed several of the municipality political documents outlining the overall politics related to the areas of concern in this project.

In summary, I have applied methods of documentary and literature review in respect of:

- The different climate actions plans, business strategies and other central policies from the participating (and others) municipalities
- Central acts and orders, and official guiding materials on the legal regulatory framework within the three spheres of interest: environmental regulations, green growth (business support, public procurement, etc.) and energy efficiency
- Central policy documents such as evaluations, committee recommendations and other similar documents within these areas
- Literature reviews of concepts, ideas, past knowledge and discourses that influence the field of study including the varies sub-analyses

QUANTITATIVE INPUTS COLLECTED RELATED TO THE CARBON 20 PROJECT

In addition to these qualitative data collection methods, I have also carried out some more quantitative data collections and processing on the Carbon 20 project – however, not addressed specifically in this PhD.

As already mentioned I have been responsible for an early monitoring of the progress of the project 20. This has as mentioned involved monitoring the companies GHG emissions using a Danish web based CO_2 calculation tool in respect to the emission from each participating company. This has been added an Excel sheet over the companies including also information on the companies' type and seize, the status for the process etc. The Excel sheet are attached electronically (for the Assessment Committee etc.) and referred in above-mentioned list in Appendix A). Based on this information various overall quantitative information has been processed including overall GHG reduction figures for the project as a whole. These have been reported in the final monitoring report of 2013, AAU (2014). The project has chosen to monitor on the aggregated Carbon dioxide equivalent. The changes in the ratios of RE in the energy net (electricity and district heating) over the 3 years period does contribute significantly to the achieved savings.

A second Excel sheet (also attached electronically and listed in Appendix A) has been formed based on the varies energy saving options suggested by the different energy consultants as well as information on status for their implementation from the municipal officers follow up dialogue with the companies. The screening included for most of the suggested savings some estimates on expected investments cost, expected energy savings and/or GHG reductions as well as the expected economic yearly savings. Based on this information the final monitoring reports includes some findings about what have been the main focuses in companies climate work (e.g. implementing LED) including the aggregated figures in saving potentials and cost/gain ration for these (see AAU, 2014). These conclusion is however somewhat vulnerable for a number of reason. First of all the mentioned estimates was not appropriate available for all suggested solutions in the various screenings. In addition, the various energy consultants have used some different wordings for related suggestions. The gathering of the data represents therefore some sentencing of suggested solutions judged to be similar.

This PhD due not specifically address neither of these analyses and processing of data. Some of the insight and conclusions are referred during the PhD with specific reference to the final monitoring report.

2.3. EPISTEMOLOGICAL AND METHODOLOGICAL CHOICES AND METHOD USED

I have in this chapter extensively discussed the epistemological and methodical fundamental choices for this research project.

I took the point of departure in Adolphsen's distinction between the immediate practical problem and its underlying connected scientific problem(s) – the dialectical dynamics between appearance and phenomenon. I discussed Illeris and Flyvbjerg so as to avoid my research looking only at the immediate practical problem in terms of staying on the surface, nor remaining within the "Ivory Tower", with theories of little relevance and contribution to real life.

Based on the discussion of Illeris and Flyvbjerg I clarified two specific interests in the overall research – the scientific problem accompanying the practical problems introduced in last chapter – both aiming to respective: provide insights that are directly applicable in respect of the assessed context and particular situations, as well as broader perspective applicable for inspiration in similar situations and "academic" understanding. These two perspectives include:

1. A learning perspective on the abilities of the municipalities (and especially the participant officers) to actively influence local companies. The aim is both a) the direct enhancing of the participating municipality (and officer) exercised practises, which then can b) form inspiration for other municipalities and officers attempting to engage in similar projects
2. A critical governance perspective on the societal framework setting the boundaries for the municipality actions. The aim is again both to a) provide insight into – and feedback to – the specific contextual societal (DK) frameworks, but further b) add to a broader discussion of the role of the municipalities in respect of GHG reductions.

Departing from Flyvbjerg's critique of applying "ideal theory" in the social sciences, combined with introducing the ideas of interdisciplinary (or transdisciplinary) research, I note that I apply conceptualisations, "theorisations" and past knowledge in three distinct ways:

1. As input for forming and presenting my epistemological and methodical choices in this chapter – presenting the value-based point of departure for the research
2. As an overall conceptual framing of the two core perspectives of an overall governance/governmentality discussion, but maintaining an underlying learning perspective, and
3. In relation to assessing (analysing) the "discourses" of past knowledge, theorisations and concepts of the specific field of interest.

Building on Flyvbjerg's use of case study, I suggested that the Carbon 20 project forms a deviant (extreme) case, but further that it actually for some analyses could functioning either as a critical or paradigmatic case. I further showed that the case is actually made up of seven cases, which together encapsulate the variety of Danish municipalities.

Departing from Illeris' "participatory steering", I introduced the way I have grounded my research in the actual practises and interests of the seven municipalities with respect to the Carbon 20 project. Participants have not been involved directly as co-researchers, as suggested by Bergold and Thomas, but my research perspective has been formed on behalf of the officers learning perspective on the project – capturing this by adding a third loop to the concept of Argyris and Schön's learning vocabulary.

I further argued that participation in the Carbon 20 project has formed a platform for a rich pool of empirical data and deeper insight into the everyday practice of the municipalities (participant officers), with some data used directly in the analysis, and other data forming background knowledge and input for the progressing of the research focus and thus directing the specific data collection method applied.

Supplementing such information, I have used qualitative interviews as a key method to gather the empirical data. First and foremost consecutive interviews were undertaken with the participant officers – face-to-face single and/or focus group interviews and telephone interviews, but also trough open-ended questionnaires. I also interviewed some of the participating companies and energy consultants, as well as officers from the Danish EPA and experts within the field. The interviews were supplemented by reviews of various kinds of documents: academic contributions, specific acts and other legal documents, overall policy documents (action plan, strategies etc.) and political documents such as evaluations, recommendations etc.

In connection with the monitoring of the project different more quantitative measurement have also been applied. These are, however, only used partial for this PhD.

Altogether, the applied methods have resulted in rich pool of data, which has been taken as the point of departure for formulating research questions and exploring, analysing and "theorising".

As argued in last chapter, my research has put emphasis on five specific related but still different elements. These are each analysed separately and combined in a sixth separate assessment, whereas the core of some of them is presented as "stand-alone-papers". For each of these specific analyses the chapter/papers therefore draws up

the specific method and information applied for that analyse and thereby specifies this overall method presented here.

CHAPTER 3. CONCEPTUAL FRAMEWORK

In Chapter 1, I presented the research field and the objectives of the PhD thesis. In Chapter 2 I presented the methodological base of the PhD including the basic scientific (epistemological) standpoints and understandings, as well as the research method including the case forming the empirical basis of the PhD. I made a distinction between the concepts and theorisations that I apply to develop my conceptual framework for structuring the field of interest, versus the concepts, and past contributions of the field of study. The transdisciplinary approach implies that the latter depends on the specific assessment and understanding of the sub-questions asked and thus may apply quite different – and not necessarily coherent – conceptual perspectives.

The object of this chapter is to present my conceptual framework. The various conceptual and theoretical perspectives presented in this chapter are thus used as my framing of the overall conceptualisation of the field.

As argued in the last chapter this conceptual framework is not to be understood as a preliminary (theoretical) point of departure for the analyses conducted. It has conversely been developed dialectically in an iterative process of engaging with the field and reflecting on the insights gained in respect of previous contributions. This conceptual framework is thus an attempt to iteratively develop a coherent framework for the different discussions and analyses of the PhD.

3.1. PICTURING OF THE CONCEPTUAL FRAMEWORK

In Chapter 2, I explained that I had two interests in this PhD thesis and the formulated research question (the scientific question accompanying the practical problem): a governmental focus on the municipalities as local governments placed within the governance of climate change, and a specific learning perspective on the particular participating municipalities.

This image of the overall conceptual framework takes its point of departure in the governance perspective and draws heavily on the governance and governmental literature. I maintain the learning perspective as the underlying premises for my participatory research approach and combine the two in the focus on a change of governing practises to improve overall governability.

This chapter expands the figure presented in Chapter 1 (see Figure 5) in terms of adding an overall governance structure perspective on the municipality activities for

encouraging change among local companies. I also include the learning perspective in this picture of the governance system below by including the municipal (officer) as "reflective dialogue partner" as a concept for discussing leaning in respect of municipality interaction with companies as core element in their attempt to improve the overall governability.

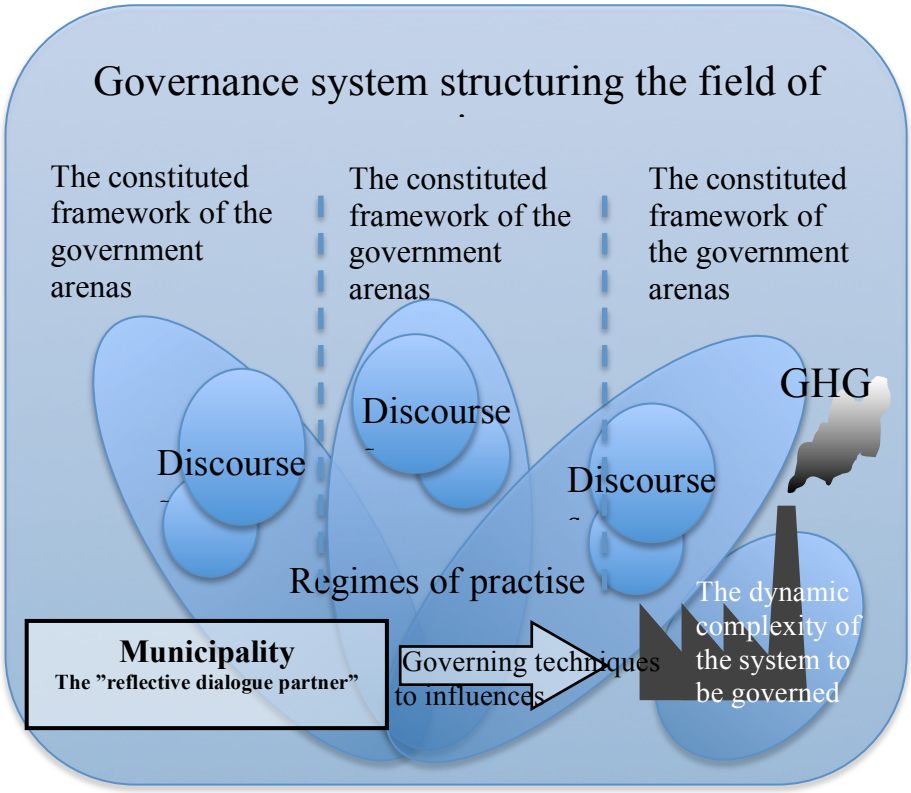


Figure 5 – The conceptual framework: the governance system for municipal influence on local companies to reduce GHG emission (Own production)

Throughout this chapter, I will present the input upon which I rely on to draw up this picture of my conceptual framework. I commence by introducing my overall understanding of governance and governmentality as the overall framework, before explaining the specific concept applied in the figure.

3.2. GOVERNANCE AND GOVERNMENTALITY

Within the governance literature a common claim is that a shift has taken place "from 'government' to 'governance'" (Among others, de Loë et al., 2009; Kemp et al., 2005; Sundström and Jacobsson, 2007). Government is understood in this phrase as a rather uniform hierarchical system, whereas governance refers to a more network-based form with a diffusion of boundaries between private and public actors and a shift in the way both private and public sector activities are governed (Sundström and Jacobsson, 2007).

Looking specifically at the state as a centre for government, Rhodes (1994 and 1996) introduced the concept of the 'hollowing out' of government. This refers to an altered situation, where the national government has delegated activities 'downwards' to local governments, 'outwards' to private organisations, 'inwards' to semi-autonomous state agencies, and 'upwards' to international organisations (Sundström and Jacobsson, 2007).

Similar to this "hollowing out", the term "multi-level governance" introduced briefly in the first chapter has also been applied to discuss the idea that governance structure is increasingly crossing both vertical levels of government bodies (local, regional, national, continental, international and globally), and horizontally[24] between public and various private agencies. The multilevel governance concept originates as a framing for assessing the EU's regional coherence policies, but is being enlarged both by geographical coverage and the context addressed (Bache and Flinders, 2004). As outlined in Chapter 1 it has, for example, been adopted to broadening the discussion of international political environmental agreements, and specifically the climate change agenda. Bulkeley and Newell (2010) use the multilevel governance perspective to enrich the debates on global governance of climate change, but also more specifically as a framework for discussing the role of local government within this overall governance of climate change (Betsill and Bulkeley, 2006; 2007; Bulkeley and Betsill, 2010; Bulkeley and Newell, 2010).

My interest in this PhD is centred on local government – municipality – interactions with companies to encourage a specific change – an act of governing. The focus of attention is thus on the horizontal interaction with companies – Type II in Bulkeley terminology, as presented in Chapter 1. I acknowledge that the municipality horizontal interference on companies is interdependent on both the specific

[24] Bulkeley and Newell (2010) use "Type I" and Type II" instead of vertical and horizontal – see Chapter 1. I find however vertical and horizontal more precise for capturing (and indicating) the content of the meaning

characteristic of the local companies that they are attempting to address, and also on the overall governance frameworks that the municipalities act within. The latter being its position within the vertical governance system – Type I in Bulkeley terminology.

Taking a specific point of departure in the municipalities as local government my focus is on the role of local government in the governance of climate change also addressed by Bulkeley, Newell and Betsill etc. – see Chapter 1. They do however approach the local authorities more holistically in terms of assessing the multitude of activities that local government takes on the climate agenda (internal, regulation and enabling actions by other as well as municipal services). Conversely I take a more narrow focus on the activities directed at local companies in the reduction of GHG emissions – not including climate adaptation.

To elaborate on this interest and understanding, I find Kooiman (1993a; 1993b; 2003)'s approach to the governance debate, as well as Dean (2010) and Lemke (2002) presentations of Foucault thought on governmentality more useful. They are all concerned with how governmental actors – governors – influence others by different means. They all further address how the overall governmental system structures the actions of these governors.

I will therefore present their conceptualisations below as the point of departure for explaining how they form the background for this conceptual framework, starting with Kooiman and subsequently the governmentality literature.

GOVERNING AS GOVERNANCE - KOOIMAN

Kooiman (1993) makes a distinction between "governing" as covering *"all those activities of social, political and administrative actors that can be seen as purposeful efforts to guide, steer, control or manage (sectors or facets of) societies"*, and "governance" as the *"patterns that emerge from governing activities [*… to form the*] more abstract (higher level) framework for the day-to-day governing"* (Kooiman, 1993a: 2).

Kooiman (1993a) argues that many countries over recent decades have tended to shift balance between government and society in terms of both privatisation and deregulation. He further finds "a third" shift towards sharing tasks and responsibilities – *"doing things together instead of alone"*. Kooiman's interest is in the latter interactive public private approaches to governing in terms of co-regulation, co-steering, co-production, cooperative management and public private partnerships on national, regional and local levels. He specifically labels such co-arrangements as social-political governing or –governance as a specification of the overall governing and governance terms (Kooiman, 1993a).

Kooiman argues that such "new ways of governing" mark a shift away from seeing governing as "one-way traffic" towards "two-way traffic" including both the perspective of the governing system and those of the system to be governed (Kooiman, 1993a: 4).

Kooiman sees such shifts as responses to the growing realisation of the enormous complexity, dynamics and diversity of the socio-political (sub-) systems to be governed. Governing activities are intervening in highly complex and dynamic subsystems, each having diverse characteristics. The success of governing is therefore dependent on how the governed reacts to the given means applied. The governing approach therefore needs to be dynamic, complex and varied as well. This means that the governing approach should be adaptive in respect of fitting the means applied towards the dynamics and complexity of the targeted subsystem (Kooiman, 1993; 1993b).

The governance system is itself a highly complex and dynamic system, covering both policy formation and execution with variations between policy levels and fields etc.: *"These qualities* [the dynamics, complexity and diversity] *not only apply to the object to be governed* [the targeted socio-political system]. *Governing, governance and governability themselves have dynamic, complex and diverse qualities of their own"* (Kooiman, 1993b: 36). This means that governance systems themselves need to be viewed as multifaceted with diverting and sometimes even conflicting governing approaches.

In a later publication from 2003, Kooiman introduces a three level order of governance: 1st orders, 2nd orders and 3rd orders. The latter he also frames as meta-governance.

"First order governing" refers to the specific means (or instruments in Kooiman's wording) that governing agencies apply in their day-to-day governing activities of identifying and acting on socially shaped problems. He specifies his earlier conceptualisation of the governing activities of interest, distinguishing between three modes[25] of governance-instruments in terms of respective: hierarchical modes of steering and control; self-governance in terms of enabling actors to control their

[25] I have earlier (in Chapter 1) introduced Bulkeley and Kern (2006) that applied a slightly different framing of such modes of governing, distinguishing between *self-governing*, *governing by provision, governing by authority, and governing through enabling*. Their aim with this framing was to catch the broad variety of actions that local government takes towards the climate change agenda as a whole. My focus is restricted to the activities directed towards influencing local business, and thus the modes I am interested in centre on the character of such interference/interactions,

own actions; and finally co-governing where governing and governed actors work together to achieve targeted goals (Kooiman, 2003; 2009).

"2nd order governance" refers to the constituted framework for carrying out first order governing in terms of system agreements, rules and procedures. A central element for understanding specific governing activities is thus also to look at the specific regulatory set-up within which such governing takes place. The governing choices of those in charge are thus dependent on the overall regulatory framework within the field including guiding materials; formal competences and allocated agency; as well as the resources and skills assigned for the task etc. (Kooiman, 2003; Kooiman, 2009).

3rd order governance" – or meta-governance – refers to the values, norms and principles that underlie (are underpinning) the various lower order governance choices. *"The governance of governance"* in terms of the discussion, formulation and application of governance system values, norms and principles that are to govern the governing processes (Kooiman, 2003; 2009).

Kooiman (2009) specifically argues that difficult governing choices – what he frame as hard choices – often have to do with conflicts between values and norms that are incompatible, incommensurable and incomparable by nature. It is therefore important that governance norms and the principles behind them are made explicit, which they often are not (Kooiman, 2009).

Kooiman further uses the term "governability". With this he addresses the overall governance system capabilities (the created pattern of solutions or developed strategies) to actually respond to the identified governing needs in terms of the identified problems and situations in the system to be governed that necessitated the intervention in the first place (Kooiman, 1993; 2003).

GOVERNMENTALITY

With the introduction of these interrelated terms of governing, governance, meta-governance and governability, Kooiman in my reading comes close to capturing some of the same interrelated processes that Foucault attempted to address with his term "governmentality".

According to Lemke (2002), Foucault's intent with the term is specifically to build a framework for assessing the underlying rationalities for specific governing processes: "*The semantic linking of governing (gouverner) and modes of thought (mentalité) indicates that it is not possible to study the technologies of power without an analysis of the political rationality underpinning them"* (Lemke, 2002: 50).

Lemke (2002) and also Fimyar (2008) point out that "government" as Foucault applies the term, includes several aspects. It relates to a spectrum of arrangements including "governing the self", "governing others" and "governing societal (sub) system". It includes however also the very framing for these governing processes. Government in Foucault's terms is thus a broader concept than the rather narrow political understanding of the term often applied in respect of the state (Lemke, 2002; Fimyar, 2008).

A central concept used by Foucault in relation to governmentalite is the "conduct-of-conduct" where conduct is applied in its meaning as both a verb – the first conduct – and a noun – the second conduct. As a verb, conduct means to lead, direct or guide, whereas as a noun, conduct refers to the behaviour and actions of actors. The conduct-of-conduct thus refers to the purposeful guiding or directing of one's (own or others) behaviour (Dean, 2010).

Following Foucault's broad conceptualisation of power as a two-way relationship, governing is similarly twofold in terms of how it is executed, but also received – each being mutually dependent and reinforcing – or opposing – the other.

For Foucault the act of governing is – equal to Kooiman – viewed as a process involving activities that can take various forms and use diverse techniques or means to direct or guide the behaviour of the subject, group, societal subsystem etc. in question. Dean (2010) specifically argues that government in this sense is an activity that shapes the field of action – or more precisely "structuring the field of possible action" making use of a variety of different techniques ranging from direct rulings to indirect shaping of citizens value and norms (Dean 2010).

Emphasising this structuring the field of action, various studies have focussed on how government by various means shapes citizens – for example, through the educational system (Fimyar, 2008).

Dean (2010) and Jessop (2011) emphasise however that Foucault's intent with the term 'governmentality' is not restricted to the structuring the field of actions of the regulated parties. They further argue that Foucault is also interested in what actually structures the approach and choice of governing techniques and means used by the regulator. The governors (those involved in governing the behaviour of others) are themselves part of a governmental system that shapes their actual governing activities (Dean, 2010; Jessop, 2011).

Dean argues that Foucault's interest in the term 'governmentality' specifically is to provide a framework for assessing the formation of the specific governing approaches and the reasoning behind such – the rationalities underlying the government's way of governing – and not just the various governing techniques as such (Dean, 2010).

In relation to the "state", Dean (2010) argues that while often described as a relative unified actor, it is actually a multiple complex representing many diverse (and even opposite) way of thinking and acting. Jessop (2011) further advances this argument to point out that Foucault's interest was indeed in state formation and development where the state is viewed as an outcome of a specific historical process *"that produce[s] different forms of state, each with their own historical specificities, agendas and typical form of governmental practice"* (Jessop, 2011: 70).

The rationalities underlying specific governmental ways of governing are thus by no means uniform (Dean, 2010).

The object of a governmentality study is thus to reveal such diverse rationalities in terms of how they become structuring for specific governing choices:

> "Studies of governmentality (…) do not assume a single form of rationality but insist on plurality of governmental rationalities" (Bröckling et al., 2011:11).

> "One isn't assessing things in terms of an absolute against which they could be evaluated as constituting more or less perfect forms of rationality, but rather examining how forms of rationality inscribe themselves in practices or systems of practices, and what role they play within them, because it's true that "practices" don't exist without a certain regime of rationality" (Foucault, 1991: 79, ref in Lemke, 2002: 55).

In Deans' wording, the object of a governmentality study is

> "… not the simple empirical activity of governing, but the art of government [… meaning that] the governing is an activity that requires craft, imagination, shrewd fashioning, the use of tacit skills and practical know-how, the employment of institutions. … It is a study of the organized practices through which we are governed and through which we govern ourselves, what we shall call here Regimes of practices or regimes of government" (Dean, 2010: 28).

Dean (2010) defines such regimes of practise as referring to the historically constituted assemblages of various institutionalised rationalities for how to conduct others conduct.

These "regimes of government" involve practices for the production of truth and knowledge, and comprise multiple forms of practical, technical and calculative rationality. *"Regimes of practises are simply fairly coherent sets of ways of going about doing things.* [The] *institutionalised practises ...* [meaning] *the routinized*

and ritualized way we do things" – the established truth of how to govern within specific governmental settings (Dean, 2010: 31).

Dean emphasises that several different regimes of practises can co-exist within the same overall governmental system. Regimes in Dean's wording do not include the totality of, for example, the state. Conversely it is used to capture the idea that different practices evolve within different governmental subsystems:

> Within given society there is a large, put finite, number of intermeshing regimes (that) link up particular institutions. … However, such regimes are never identical with a particular institutions or even system (Dean, 2010: 31).

While Dean argues that multiple "regimes-of-practices" exist within government in general, he seems to apply the term to catch all the different practices within a given subsystem (governmental field). The practices within these subsystems might colonise and effect (and vice versa) the regimes within another subsystem, however he doesn't seems to frame this as two sets of practices "competing" or dominating within the same subsystems – the regimes form the hegemonic ways to do things:

> There are borrowings … cooperation, overlap, intersections, fragmentation and contestation between [the regimes]… one regimes of practise might attempt to colonize and subjugate another (Dean, 2010: 31).

Dean introduced the concept of "analytics" as a type of analysis of the specific conditions under which particular entities emerge, exist and change. Analytics of government thus *"examines the conditions under which regimes of practices come into being, are maintained and transformed"* (Dean, 2010: 31).

The objective of such an analytics of government is thus to deconstruct the taken-for-granted practices and thereby show that such are not self-evident. This allows questioning how things are done and how we think about them and further that it is possible to do things differently (Dean, 2010).

The terms 'governmentality' and 'regimes of practices' thus apply a dynamic (evolutionary) perspective implying that not only are the existing practices historically constituted, they are continually reshaped by the way that they are executed. This brings a clear link to the learning perspective of this PhD thesis, as the objective precisely is to enhance the competences of the municipal (officers) to alter practises so as to improve the overall governability.

GOVERNANCE AND GOVERNMENTALITY IN THIS PHD THESIS

As presented above, Kooiman argues that the huge complexity and the dynamics of the various societal subsystems calls for a flexible governance approach in terms of applying a variety of governing techniques, and constantly adapt in terms of which proves successful for affecting the targeted subsystem. This can include a whole range of techniques, from hierarchical means of, for example, command-and-control, various ways of co-governing, and efforts directed at enabling self-governance – what I try to capture in this PhD with the wording of "influencing".

Similarly, the governmentality tradition specifically calls for a broad understanding of government in terms of an interconnected line of government activities ranging from the single actors' (citizens) conduct of their own conduct, and the various governmental conducts in structuring the conduct of citizens through various power techniques ranging from direct execution of power to more indirect guiding.

Both Kooiman and Dean/Lemke stress that even means of hierarchical governing shall be interpreted as a two-way interaction in terms of both the perspectives of the governors, but also from the perspective of how the governed respond.

The interest of both Kooiman and Dean is however broader in respect of also assessing how the governance system structures the means applied by the governors. This interest in the governance system corresponds to my interest in respect of the three assessments of the three different fields or governmental subsystems: direct environmental regulation, energy efficiency and business support for green growth.

Kooiman sees the governance system itself as a complex, dynamic and diversified system consisting of several subsystems, each having its own characteristics. A governance perspective is thus also interested in the processes that actually shape the specific governing techniques or means - 1st order governance) – what Kooiman frameworks as 'governance of governance'. This includes both the constituted framework – 2nd order governance – and the norms and values underlying the specific governance approaches – 3rd order governance or meta-governance.

Dean and Jessop similarly emphasise that an analytics of governmentality specifically also addresses how the application of the specific governing techniques and approaches are themselves shaped by the specific historical constitution of the governmental (sub)systems. The objective is specifically to point out that the established way to do things is by no means the only one possible – allowing a reframing of the approach.

Dean introduces the concept of "regimes of practice" to capture the idea that the actual practice as performed by the governors is constituted by a series of

institutionalised rationalities with a different appearance within the specific governmental subsystems.

My conceptualisation of governance draws on both these perspectives and thus conceives the governing processes as taking part within a line of interlinked interactions – or conduct-of-conducts – effecting the governing practices. By governing practise I refer to: the governing approach and the means (techniques) available for the municipality (officers) to apply to influence the companies' behaviour. The success of such – or governability – depends on how the different specific companies then respond to such interference, which again depends on the specific multifaceted dynamics they act within.

As explained, the focal point of attention for this PhD is the municipality as the governors executing governing of the companies. With this as the centre in the line of interconnected conduct-of-conducts, the next subsection looks into

1) The dynamics and complexity of the subsystem to be governed – the companies (the "object" of the horizontal hollowing out – Type II – in respect of multilevel governance)

2) The governance system structuring the available means (or techniques) and actual governing approaches – the regimes of practices – of the municipalities as governors (the governor's position within the vertical governance system – Type I).

3.3. THE DYNAMICS AND COMPLEXITY OF THE SUBSYSTEM TO BE GOVERNED

Following Kooiman's presentation of the dynamics, complexity and diversity of the subsystems to be governed, I conceive companies as diverse complex (sub)systems, where different dynamics form different responses even by similar companies.

In contrast to the typical neoclassic economic assumption of the company as a rational sub-optimising entity, my basic understanding of companies is much more diverse and dynamic. As departure point for such dynamic understand of companies I find Porter's framing of companies and their various strategies suitable, at least for the purpose and attention given to companies in this PhD. Porters work imply that companies actions are dependent on both internal organisations of competences and task abilities, as well as the companies placement within (and interpretation of) the dynamics of the sector in which they compete (Porter, 1979; Porter, 1985; Porter, 2008a; see also Pedersen et al., 2001).

Porter (1985) argues that companies are a specific organisation of different activities related to several diverse functions needed to produce and sell goods or services – a "value chain". He distinguishes between what he calls primary

activities in terms of those directly related to the value creation of the product/service (e.g. inbound logistics, operations, outbound logistics, marketing and sales) vs. secondary activities or supporting functions that cut across this value creation (in Porter's view: e.g. procurement, human resource management, technological development and infrastructure). How such value chains activities are specifically organised and carried out affects the cost structures, the company's abilities to differentiate themselves from the competitors and respond to changes, and thus their ability to make a profit (Porter, 1985).

In 1979 Porter had already provided a framework to understand the strategies of companies as a response to diverse dynamics within the sector in which they compete. He introduced five interrelated forces (rivalry of existing companies, treat of both new entrant and/or substitute products, as well as the bargaining power of respective suppliers and purchasers), which can and often do vary significantly within different sectors. Along with the internal organisation of their value chains, company strategies are also determined by how they interpret these five forces (Porter, 2008a).

Mintzberg et al. (1998) criticises Porter's framework for providing an overly rational understanding of business strategy and implementation, arguing that there is huge difference between formal strategy and actual practice.

Mintzberg argues that strategy formulation cannot be understood as a rational process of conscious ideas formulated by top management in respect of specific parameters and then subsequently fully implemented in an organisation. Mintzberg emphasis that the idea of this split understanding between strategy development and implementation assumes that strategies are formulated explicitly through a rational process. Mintzberg argue that such overlook the more implicit understandings, traditions and norms of the particular companies that also are decisive for the actual strategies and behaviour of the companies. Mintzberg makes a distinction between intended strategy (rational planning) and realised strategy (what actually happened) to point out such differences. He proposes a third alternative in terms of an emergent strategy. Such strategies are not necessarily formally adopted and planned, but constantly evolve and obtain their form and content from the specific action, and by learning from past experience. The latter, he argues, is more accurate in relation to how companies are actually working. Most plans are implemented through adjustments, with a great deal of trial and error, where actions that proved unproductive are dropped and replaced by others (Mintzberg et al., 1998; see also Mac, 1999 and Pedersen et al., 2001).

Summing up in respect of the governmentality literature, the companies' conduct of own conduct is dependent on both their internal capabilities and their organisation of such, how they perceive their competitive situation in the sector, as well as the developed practices and norms for how to respond.

Chapter 5 will focus on some of these discussions, particularly in relation to the various challenges for companies implementing energy savings.

3.4. REGIMES OF PRACTISE AND DISCOURSES WITHIN GOVERNMENTAL ARENAS

After having briefly outlined my basic understanding of the companies to be governed, I now turn attention to the governance system in terms of the – vertical – governance aspect that structures the municipality governing approaches and techniques (or means) applied – their governing practices – in their interventions to encourage a change among those companies. This forms the conceptualisations for the focuses of Chapter 6, 7 and 8.

As already shown, I adopt the term 'regimes of practices' as core for capturing my interest in the actual performance of the municipalities. "Regimes of practices" specifically captures the idea that the performance of the municipalities shall be understood in light of the specific historical constitution of different understandings and rationalities into a specific framing for how to govern, but also that such are changeable. "Regimes of practices" represent thus a very dynamic and intermeshing term.

Contrary, Kooiman's use of an interconnected line of 1st, 2nd and 3rd order governance provides analytical options to distinguish different elements. This interconnected line do however also provide a more static appearance, where the 3rd order provides the boundaries for the 2nd order that subsidiary provide the boundary for the 1st order.

None of these resembles specifically the regimes of practices. The 1st order refers specifically to means or technologies – equal to governing techniques in the governmentality literature – and thus not the practices. The 2nd order refers to the institutional frameworks.

I want to maintain the dynamic focus centred on the actual practices performed, as one of the central discussions in the Carbon 20 projects relates to the altering of such practices. However, I do find it valuable to try to distinguish between the different elements that are blurred into forming regimes of practices. Contrary to the appearance of the 1st, 2nd and 3rd orders, I perceive the elements as much more blurred and dynamic, whereas each of the element affect each other.

For my focus I find it useful to separate out Kooiman's 2nd order governance in terms of "the constituted regulatory framework", addressing specifically how this is currently constructed, not however naming such 2nd order. I further find it useful to try to separate out the underlying different rationalities and the understanding

dominating the different fields. I am, however not quite satisfied with Kooiman's 3rd order governance.

Foucault himself used the term 'discourse' to capture such a coherent (and competing) system of thoughts and ideas. Foucault's use of discourse has been summarised by Lessa (2006) as

> "Systems of thoughts composed of ideas, attitudes, courses of action, beliefs and practices that systematically construct the subjects and the worlds of which they speak" (Lessa, 2006).

Lessa's definition includes practices, which I – following Dean's interpretation of Foucault – consider something different, but affected by (but also re-affecting) such discourses.

Throughout the 1990s and onwards, academia has increasingly paid attention to discourses as centre of analyse resulting e.g. in the forming of a specific scholarly discipline – discourse analyses – that puts emphasis on the articulated (written) text and the ideas and the thoughts underlying them (see, e.g. Fairclough (2003) as exponent of critical discourse analyses). As I haven't carried out any consistent discourse analysis, I was hesitant to use this term. I instead turned to the term 'paradigm' as this similarly has been used to capture such underlying thoughts and ideas within specific demarcated fields.

The two terms are often used to capture some of the same dynamics, but have historically been applied in respect to different contexts. Dryzek (2007) therefore argues for a distinction in terms of paradigms as related to knowledge production, and discourses to societal development. As my focus is the latter I apply 'discourse' as the term used in this PhD thesis rather than paradigm. I will however below outline the concept of paradigm and show that it has been used interchangeable to how I apply discourse. The reason for this outline is among others that "paradigm" is used in some of the papers.

Kuhn introduced the concept of 'paradigm' in 1961[26] as a central term to capture the way that "scientific communities" developed common shared understandings, assumptions, theories and worldviews for the execution of science and production of knowledge (Kuhn, 1970).

Kuhn used the term specifically in respect of knowledge production within natural science and specifically refrained from applying the term in respect to the social sciences, arguing that the stability of a dominating paradigm never seems to gain sufficient followers as they are constantly drawn into question.

In spite of this, the term has been widely applied in relation to the content of the social sciences – and specifically in the context of the environmental challenges. Pirages and Ehrlich (1974), and Milbrath (1984) for example, uses the term 'dominant social paradigm' (DSP) to argue that (western) societal development is dominated by rather coherent set (economic) understandings of – and approaches towards – how society (and the global economy) is organised. Milbrath specifically

[26] In "The Structure of Scientific Revolutions" Kuhn assesses the history of scientific development (Kuhn, 1970). In this, he questioned the then common understanding of the history of science as a more or less linear accumulation of knowledge. He instead argued that science has been characterised by changing periods of stability and disputes in terms of what he frames as "normal science" vs. "scientific revolutions". The periods of "normal science" are characterised by hegemony of shared understandings, theories and worldviews about how to conduct and interpret new knowledge within "scientific communities", whereas "scientific revolutions" are characterised by the opposite. Kuhn describes such shared understandings, theories and worldviews about how to conduct and interpret new knowledge production as "paradigms" that allow "members" of the scientific community to engage in "puzzle-solving" scientific work in terms of fitting in unsolved problems within the overall paradigm. Some of these problems and observations may however prove to be "anomalies" in respect of the established paradigm – meaning that they don't fit within the established common understandings, theories and worldviews. If such anomalies accumulate it may potentially lead to "scientific crisis" where the establish paradigm is questioned. Typically scientists will under a "normal science period" try to stretch and adjust the paradigm to encompass such or dismiss them as errors in observations. Difficulties in providing proper explanations of the phenomena may also cause scientists to seek alternative explanations that may give rise to competing paradigms. If such paradigms seem to be able to provide solutions to the anomalies, while also provide proper explanations for existing knowledge taken for granted in the previous paradigm, the new (alternate) paradigm may eventually manage to take over as dominant – causing a " shift" in terms of altering the basic understandings, theoretical approaches and assumptions of the science community. Kuhn uses the term "scientific revolution" to point out how dramatic the changes might be, but also how fierce the conflicts between adherents of competing paradigms can be (Kuhn, 1970; See also Madsen et. al., 2000).

calls for a paradigm shift as a necessity for managing the increasing environmental challenges (see also Kilbournea et al., 2002).

Colby (1991) has broadened out the use of paradigm in respect to the co-existence of several such paradigms that overlap in shaping actual policies and management practises within the environmental field[27].

Mortensen (2000) has similarly used 'paradigm' in looking specifically at Danish environmental regulation of companies, and argues that the intermeshing of distinct paradigms has blurred the regulatory framework and thereby the boundaries for the performance of the competent authorities execution of the regulation (Mortensen, 2000).

Colby and Mortensen's use of Paradigm closely resembles what I intend to capture in this PhD thesis, and Mortensen is also referred specifically in the paper 2 forming the essential of chapter 6. It does however also marks a rather significant change in the use of the term from that of Kuhn, as it no longer relates to knowledge production within a "scientific community", but instead refers to a more or less coherent set of thoughts, theories and understandings that dominates (or compete with conflicting paradigm to dominate) the politics and practise of societal development.

Dryzek (2007) argues against this change and insist on maintaining paradigm in its original meaning related to knowledge production. He instead prefers to use 'discourses' for his assessment of such coherent sets of thoughts and ideas influencing international policy formation in the domain of environmental protection – equal to how Colby uses 'paradigm' (Dryzek, 2007).

Dryzek defines both paradigms and discourses as *"inter-subjective understanding[s] that condition individual action and social outcome"* (Dryzek, 2007: 45). He argues however that they constitute subjects in different ways. Where scientists are educated within paradigms, individuals are generally socialised into discourses. Paradigms are thus generally (more or less) cautiously accepted by the scientific society, whereas discourses in contrast can be so ingrained that subjects are unaware of them – they are taken for granted (Dryzek, 2007).

Dryzek makes the distinction that the paradigm is a coherent set of thoughts, theories and assumptions of knowledge production (including social sciences, such as neoclassical economics); where the discourses of the social processes encompass

[27] He identifies five such paradigms, two in direct opposition – "frontier economics" versus "deep ecology"; and three subsequent evolving approaches that combine those two – "environmental protection", resource management", and "eco-development" (Colby, 1991).

shared concepts and ideas that influence society formation. He does acknowledge that there are connections in terms of discourses that might draw on the paradigmatic understandings of different scientific traditions e.g. liberal policy discourses drawing on neoclassical economic theory (Dryzek, 2007).

While it conceptually might makes since to make the distinctions between paradigm and discourses, I find that these concepts – at least within the social sciences – are interconnected, intermeshing and overlapping e.g. that some of the assumption made in neoclassical economic theory originates on a liberal worldview.

I chose to adopt the concept of discourses for this PhD as what I seek to capture with the term is more related to the ideas and thoughts dominating a societal field – in terms of past knowledge of the field – rather than the assumption for the production of scientific knowledge within scientific communities.

In summary, I make a distinction between "discourses", the "constituted regulatory frameworks" and the actual "regimes of practice" including the applied governing "techniques" (means) of a given governmental field or subsystem.

I use the term "discourse" to capture the assembling of coherent rationalities and understandings of how to perform governance within the field, where several competing (or conflicting) discourses influence the way regulatory frameworks are formulated and interpreted as well as the performed practices, which however opposite also affect the discourses.

The "constituted regulatory framework" is the formally established legal and institutional settings forming the overall boundaries for the specific execution of the regulatory "practices". The regulatory framework is the formal (contemporary) implementation of the different underlying discourses.

I use the term "regimes of practices" to capture the institutionalised performance exercised within these boundaries and the applied means and techniques (modes of governing), in which the overall frameworks are interpreted, adopted and adapted in respect of the past experiences, basic understandings, and socialised discourses of the governors.

This outline of the three levels of focus will still be interpreted from a dynamic evolutionary perspective, where the elements mutually and iteratively affect each other.

To capture the stable, but still constantly evolving character of such subsystems and their boundaries, I find that the terms 'subsystem' or 'fields' applied above appear to be rather stable terms of the drawn boundaries. I turn instead to the concept of 'arena'.

Jørgensen and Sorensen (1999) apply the concept "arenas of development" in respect of capturing the – at the same time stable, but still changing – space of development for technological innovations[28]. They conceptualise arenas as: *"...a cognitive space that holds together the settings and relations that comprise the context for product or process development"* (Jørgensen and Sorensen, 1999: 410).

Writing in the context of technological innovation and development, the cognitive space is their framework for the technological development that takes places within specific, but also constantly changing constellations. As new actors enter such arenas, or the arena is merged with other arenas, the established configurations and constellations are restructured – a reframing of the common understandings and applied practices of the field. This provides opportunities for a transition from the past path (Jørgensen and Sorensen, 1999; Jørgensen, 2012):

> The metaphor 'arena' … refers to the word's original meaning in Arabic – 'sand on sand' – to indicate the spatial and relational temporality and fluidity of the phenomena for which the approach provides the analytical framework. Arenas provide the place and space for socio-material interactions (Jørgensen 2012: 1001).

They adopt the concept of an arena from Fink (1989), applying the term 'arena' within the social sciences: *The arena concept in social science refers to the arena as a structured battleground or framework for a regulated activity* (Fink, 1989:13 own translation from Danish). Renn (1993) adds, specifically in respect of the political sphere: *"The arena concept attempts to explain the process of policy formulation and enforcement in a specific policy field"* (Renn, 1993: 181).

[28] Jørgensen and Sorensen use of the term originate from and contribute to the transition literature. The transition literature point out – by using different terms such as "technological paradigm", "socio-technical regimes", "co-evolution of technologies and institutions", "path dependency" etc. – that the innovations and technological development is taking place within a context. The specific technological innovations are co-shaped and co-shaping the established societal frames and the mutual interaction of several different actors (e.g. Garud, Kumaraswamy & Karnøe, 2010;; 2011; Jørgensen, 2012; Kemp and Rotmans, 2005; Saviotti 2005; Schienstock, 2005). Jørgensen and Sorensen argues that several of these transition perspectives tend to overemphasise the – admittedly strong – factors and processes that structure development into specific "technological trajectories", whereas they call for an analytical perspective that empowers the actors involved to change and redefine such settings. The "arena of development" is their attempt to provide such an analytical framework empowering the actor involved in the innovation processes (Jorgensen, 2012; Jørgensen and Sorensen, 1999).

The term "arena" in this PhD thesis is used to capture what the governmentality literature frames as 'governmental subsystems'. With an emphasis on the stable, but at the same time fluctuating character of this, I frame it as "governmental arenas".

The inspiration to apply the arena term in this PhD is Jørgensen (2012)'s notion that the merging of otherwise separate arenas provides the potential for a reframing of the existing configurations – in the context of this PhD the discourse and regimes of practices. As explained in the introduction (Chapter 1), municipalities are starting to work across the policy fields of interest in this PhD thesis in terms of environmental regulation, business support and energy efficiency. This means that such otherwise separate arenas are merging, allowing a reframing of basic approaches to conduct governing of the local business.

My use of "governmental arenas" departs from Jørgensen's use of "arena of development" by more than the object of focus – arenas for exercising governing instead of arenas for technological development.

Jørgensen's use of arenas is – similar to Dean's use of "regimes of practices" – attempting to provide an all-inclusive term to capture the different (discursive or paradigmatic) understandings that different actors bring into the development processes, and the established constituted boundaries and institutional settings for the practices that are performed. As mentioned I attempt to diversify the analytical perspective into its different elements, while still maintaining the evolutionary perspective that both terms advocate.

"Governmental arenas" are, for this PhD thesis, to be understood as, on the one hand relatively stable, but at the same time also volatile field or sphere bounded by a (changeable) "constituted regulatory framework" formed by the institutionalising of various more or less coherent "discourses", that shapes (sets the boundary for) the actual "regimes of practices" performed and the used specific governing "techniques" and means.

The arenas have their own dynamics of connection between the different elements (discourses, frameworks, practices), but an altering of the overall boundaries (constituted setting) of such arenas, for example the merging with other arenas, challenges the established regimes, as the various discourses and rationalities for performing governance are enlarged.

Following the vocabulary introduced above; what I am interested in within the three "governmental arenas" of environmental regulation of companies, business support and energy efficiency policies is:

- The overall constituted regulatory framework of the arena and the municipality position, responsibilities and allocated of resources within it – Kooiman's 2nd order governance or the boundaries of the arena.
- The core rationalities, basic understanding and assumptions as well as theories of why and how to govern dominating the arena – the discourses (including potentially both dominating and competing (conflicting) discourses)
- The actual specific performance in terms of approaches and means (techniques) that the governors apply within the arena – regimes of practices – which encompass all the above institutional settings, discursive understandings etc. forming the actually blurred specific mixture of practices and application of governing techniques and means.

In other words, within each of the governmental arenas I am assessing the municipality role, responsibilities and resources within the regulatory framework (2nd order governance") and how the basic understandings (discourses) of how to conduct governance are actually applied and turned into "regimes of practices" by the municipalities including the means (governing techniques) applied. This then provides the basis for looking at the emerging merging of these arenas and discussing a redefinition of the practices of the municipal officers as actors acting across these arenas to address the specific dynamic context of the targeted companies.

This overall governance framework and discussions provide the point of departure for picking up on the learning perspective in relation to improving the overall governability. This imply to look more closely at; the competences needed to redefine the existing "regimes of practices" for how to govern (or encourage) companies to take action towards reducing their GHG emissions acknowledging the diversity, complexity and dynamics of the targeted companies.

Based on among others some of the literature introduced in last chapter of Dewey, Schön and Argyris, Chapter 9 introduces the Reflective Dialogue Partner as a concept to capturing this and discusses the learning of the participant officers during the Carbon 20 project. Chapter 10 follows up by more specifically discuss how to adapt practises in respect to the complexity of the system to be governed.

3.5. THE CONCEPTUAL FRAMEWORK FOR THIS PHD THESIS

I have presented various ideas, theoretical perspective and concepts above that I find valuable in explaining my overall approach and perspective for the assessment carried out during this PhD thesis. As argued in Chapter 2, the formation of this conceptual framework has taken form iteratively with my interaction with the context (object of study). This implies that the framework has not been used as a

theoretical outset to structure my empirical data, but conversely as a dialectical attempt to structure the various empirical inputs along the way.

As the objects of this PhD are the municipality – a public entity – activities to encourage local business to achieve GHG reduction, I turn to the perspective of governance and governmentality – both occupied with such governing processes. Kooiman stresses that the object of governance consists of diverse, complex and dynamic (sub-) systems that cannot be expected to react uniformly towards governing means. Following this general statement, I turn towards the dynamic understanding of the companies provided by, for example, Porter and extended by Mintzberg in contrast to understanding companies as rational sub-optimising entities.

As the companies may react differently to the same means, there is a need for a flexible approach and the application of a variety of different means – potentially including the whole pallet of hierarchical enforcing of norms to more indirect structuring of the regulated entities conduct of own conduct.

The governance system is itself a highly complex and dynamic system consisting of various subsystems each having its own characteristics and here framed as different arenas. A governance perspective is thus also interested in the processes that shape the specific governing choices and practices of those exercising governing – the governance of governing.

This implies that within each of the three governmental arenas: environmental regulation, business support for (green) growth and energy efficiency, I am interested in the municipality role, responsibilities and resources in terms of the constituted regulatory framework (2^{nd} order governance") and how the basic understandings (discourses) of how to conduct governance are actually applied and turned into "regimes of practices" by the municipalities.

As these arenas begin to merge – as least seen from the municipality perspective – the practices of the municipalities are up for restructuring. This provides an opportunity to attempt to alter such practises so as to improve the governability in relation to the complexity, diversity and dynamics among the targeted companies.

While taking the point of departure in the governance and governmental discussion, I insist on an underlying learning perspective. This is specifically articulated for this discussion of the attempt to establish a new "regime of practice" for such merging of the previously different arenas.

In the next chapter, I will explain how this overall conceptual framework is applied in this PhD thesis.

CHAPTER 4. THE CONCEPTUAL FRAMEWORK AND THE SIX CORE ANALYSES

The objective of this chapter is to present and explain how the conceptual framework introduced in last chapter connects the specific analyses of the following six chapters. Some of these chapters are presented as “stand alone papers” and has been prepared prior or simultaneously with the framing of the conceptual framework. The vocabulary used in some of the subsequent chapters does not necessarily follow the vocabulary introduced in the conceptual framework of last chapter.

The six following chapters du however all captures specific elements of the presented conceptual framework. Figure 6 below is an extension of Figure 5 of the conceptual framework with respect to how each of the subsequent chapters captures elements of the framework – combining thereby Figure 3 and Figure 5:

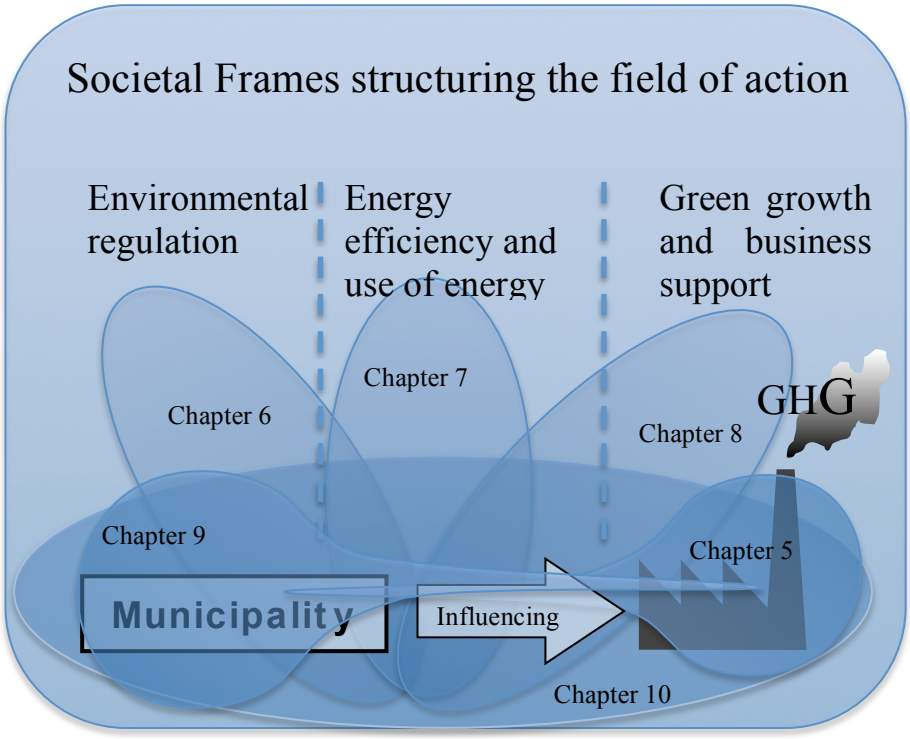


Figure 6 – The following chapters relation to the conceptual framework (Own production)

Chapter 5 addresses what I defined in the conceptual framework as the complexity of the system to be governed.

Chapters 6, 7 and 8 each address the discourses, constituted framework and the municipality regimes of practices within the governmental arenas of respectively: the environmental regulation of companies; energy efficiency and savings; and business support and green growth.

Chapter 9 looks from a learning perspective at the competences and approaches of the municipal officers in respect to improve their governability.

Chapter 10 combines the knowledge of each of these previous chapter into a discussion of how the municipalities can activate the learning discussed in chapter 9 to adapt their practices in the emerging merging of the arenas addressed separately in chapter 6, 7 and 8 in order to target the specifics of the system to be governed analysed in chapter 5.

This chapter first outlines some consequences of presenting the essential of some of these chapters as "standalone papers". The chapter further explains how the chapters form a coherent presentation of the PhD thesis in terms of how they interrelate and connect to the conceptual framework.

4.1. CONSEQUENCES OF INCLUDING "STAND-ALONE PAPERS" AS CHAPTERS

The choice to write some of the following chapters as "stand alone papers" means that these papers were prepared so that they in principle could be read independently from the rest of this PhD. This implies at least three issues needing more attention here.

1. Presenting the chapters as "stand alone paper" implies that there are repetitions in this overall introductory part A of the dissertation and the papers, as well as among the different papers. The Carbon 20 project is, as mentioned, the basic empirical base for the thesis, including all the chapters and papers. A presentation of this project and the methods used to collect and process the empirical data is included both generally in Chapter 2, and in subsections in each of the papers. The presentations of both the Carbon 20 project and especially the method applied diverge slightly as it targets the specific content, research question and parts of the empirical data used in the specific chapter/paper.
2. As argued in Chapter 2, my epistemological point of departure is the specific contextual problems of interest and focus within the case of Carbon 20. This implies an iterative process of engaging with the case to identify the problems of interest; looking into past experiences (e.g. theorisations, conceptualisations and literature contributions of the past related to the field of interest) so as to both grasp the different rationalities, theories and concepts used in the fields of interest – the discourses dominating the arena; and contribute to developing my overall understanding and framing of the object of the study. As this has been a simultaneously, iterative and dialectical process, the framing of the papers and chapters began before or simultaneously with the final drafting of the conceptual framework presented in Chapter 3. This implies that while my interest and focus was indeed in line with the content and understandings explained in the conceptual framework (Chapter 3), the specific wording etc. suggested in this are not necessarily consequently applied in the chapters. Later in this chapter, I will elaborate further on how each of the chapters targets the framework presented in Chapter 3, including how they address the specific elements.
3. The "theoretical" subsections[29] of the different chapters (papers) do not necessarily relate specifically to the conceptual framework and the

[29] Or elements/parts, as not all the papers include a separate distinct theoretical subsection

introduced governance and/or governmental literature. While not necessarily departing from this literature, the theoretical subsection of the chapters/papers does address theorisation, conceptualisation, rationalities, ideas and understandings dominating the field of study – or the discourses of the field (or arena) in the vocabulary of the conceptual framework - judged relevant[30] for the specific interest in the specific papers[31] and thereby also add to the governance and learning discussions of focus on this PhD.

The rest of this chapter will elaborate on how I establish links between the overall governance perspectives of the conceptual framework and the specific focus and theoretical and conceptual elements of the following chapters.

The chapters presented in form of papers will pick up on this and also include a specific introduction before the paper/article recapturing how the paper connect to the PhD and conceptual framework.

4.2. LINKS CONCEPTUAL FRAMEWORK TO THE FOLLOWING SIX CHAPTERS

Above I have clarified consequences of the choice to present some of the core analyses as stand-alone-papers on their own terms published (or intended for publication) separately, but also forming the core of this coherent presentation of the PhD thesis. Attention is now turned to how they relate to each other and the conceptual framework presented in last chapter.

As argued in the conceptual framework I conceive the governing processes as taking part within a line of linked interactions – or conduct-of-conducts – including the constituted framework, discursive understanding and regimes of practices

[30] My choice of which concepts and understandings to include as "discourse" of the field is by no means objective in terms of constituting THE discourses of the field. They represent my specific framing and presentation of such and thus indeed set the stage for the following assessment of the institutional settings and regimes of practices, as well as the conclusions to be drawn in respect to the specific arena in the papers.

[31] In Chapter 2 I argued that I use "theoretical" and conceptual inputs in several distinct ways: 1) my overall epistemological and methodical understandings (Chapter 2); 2) the development of the conceptual framework applied for the coherent understanding of the specific content of this PhD thesis (Chapter 3); and 3) a specific review/assessment of past knowledge in the field in terms of existing discourses, "theorisations", conceptualisations and/or rationalities, ideas as well as understandings dominating the field. The theoretical parts of the papers have the character of the latter and are to be perceived as an element – the discourses – in the analysis of the specific field of interest – arenas.

structuring/shaping the governing approaches and means (techniques) applied by the municipality (officers) in their conduct of company conduct.

As argued, the focal points of attention for this PhD are the municipalities performing the governing – the governors. With this as the centre of the interconnected of conduct-of-conducts, the focus of this PhD thesis encompasses:

- A horizontal perspective on the companies to be governed,
- A vertical perspective in terms of the governance system of the regulatory frameworks and discourses shaping the approaches and governing techniques available for the municipalities to apply and thereby their regimes of practice, and finally
- A learning perspective in terms of discussing the skills and abilities of the municipalities as a "reflective dialogue partner" to adapt their practises and improve the overall governability in the merging of the arenas.

As mentioned, Chapter 5 addresses the dynamics, diversity and complexity of the object to be governed in terms of the companies to be governed – one of the elements of the horizontal perspective.

Chapters 6, 7 and 8 address the overall governance system within three different arenas of environment regulation, energy efficiency and business support. They each address the presented three elements within the specific arena in terms of: the discourses dominating the arena, the constituted framework of the arena, as well as the municipal practises within the arena – the vertical perspectives.

Chapter 9 addresses the leaning perspective in terms of the municipal enhancing of competence to influences the companies during the project 20 – the second element of the horizontal perspectives.

Chapter 10 expand this assessment into linking the two elements in the horizontal perspectives of the interaction between the municipality and companies in terms of the municipality ability to respond to the dynamics, diversity and complexity of the system (companies) to be governed. It further include the learning from the vertical perspectives by assessing which approaches, means and governing techniques across the (three) different arenas are most suitable for adapting practices to improve the overall governability.

THE SYSTEM TO BE GOVERNED

Kooiman specifically argues that the governing approach needs to be flexible in respect of adapting to the diversity, complexity and dynamics of the targeted systems to be addressed (or governed). Following that, a preliminary issue is to assess the complexity, diversity and dynamics among the types of companies targeted. The intention of this is to obtain a picture of the issues that the governing approaches should be able to address in order to reach the intended targets – what Kooiman terms 'governability' or the ability of the governance approach to actually attain its objective.

In **Chapter 5** I analyses the system to be governed. The overall objective is to highlight what the local governance should be able to address to succeed in influencing the targeted companies to reduce their GHG emissions. The purpose of this chapter is to understand the municipality perceptions of the challenges that they need to be able to address in order to succeed in influencing the companies. Chapter 5 thereby functions as a first step for redefining the practices of the merged arena that are re-examined in Chapter 10. The focus of chapter 5 is thus on analysing company challenges in addressing GHG emission reduction. The focus, however, is narrowed down to energy savings as the paper primarily is based on the findings related to the implementation of the solutions highlighted in the energy screenings. As such it takes its point of departure in the "energy gap" literature and its attempts to explain the gap by highlighting various barriers.

This "energy gap" departs in the apparent economic inconsistency that cost-efficient solutions are not implemented. While departing from this inconsistence in a rather narrow (neoclassical) economic assumptions about the companies as rational sub-optimising entities, several of the studies do integrate additional theoretical input and broader perspectives to explain these gaps from e.g. behaviour and organisational perspectives that align with my more dynamic understandings of companies and the view presented by Kooimann of the system to be governed as highly complex, diverse and dynamic.

Equal to many of the energy gap literature, chapter 5 are to obtain a picture of the different challenges faced by companies. The intent is that such information can provide valuable feedback about how to set up political programmes and other incitements that could help companies to realise such otherwise economically sound choices.

Contrary to most of the "energy gap" literature, the empirical base is the qualitative perceptions of the municipalities' officers of the challenges encountered by

companies. Conversely the majority of the previous literature is based on quantitative survey among companies in terms of e.g. ranging predefined barriers.

Considering the municipal officer's perception of the challenges of the companies gives insight into their understanding and framing of the problems, which they should be able to address. This second hand perspective from an outsider further means that the challenges highlighted will be restricted to those apparent for an outsider following the company closely and thus properly restricted to the more significant.

Asking for qualitative statements on challenges rather than a ranking of predefined barriers further allows an empirical judgement of the character of the challenges.

Chapter 5 is presented as article submitted for publication in Energy Policy.

THE GOVERNANCE SYSTEM STRUCTURING THE GOVERNING ACTIVITIES OF THE MUNICIPALITIES

Having addressed the system to be governed (the companies) in chapter 5 (Paper 1), I turn attention to the governance system itself in terms of the constituted regulatory framework and discourses that shape the approaches, techniques and means – the toolbox – available for municipalities to apply in forming their practices.

Based on the activities and developments in the Carbon 20 project I turn to the political sphere – or governmental arenas – of: environmental regulation; use of energy consultants within the energy efficiency framework and specifically the energy efficiency obligation scheme; as well as the green growth and business support. The purpose is to assess the municipality regimes of practices within each of these arenas.

In principal, several other arenas where municipality interactions with companies provide the potential to address climate change etc. could be of interest as well – e.g. approval of building and construction work, public procurement, public transport planning etc. These governmental arenas has however not been addressed specifically during the Carbon 20 project and is therefore not part of the empirical basis for this PhD thesis. Some of the elements – e.g. municipality procurement – has been partly addressed in the discussions and exchange of experience on the green growth agenda and are partly therefore addressed in chapter 8. Other elements have also partly been addressed in various other related contexts and will also be touched upon in chapter 10, but with much less emphasis than the above mentioned three arenas.

Chapter 6, 7 and 8 address the discourses and constituted regulatory framework affecting the actual regimes of practises of the municipalities within each of these

three arenas. As with chapter 5, the perspective applied is that of the municipalities (officers) and thus their perception of their opportunities and constraints for addressing the issue within these arenas.

As argued in last section the chapters address the arenas in terms of the approach advocated in the conceptual framework, however they don't necessarily apply the specific vocabulary presented. This chapter attempts to establish the needed connections.

Within the different arenas each of the chapter addresses the highlighted element of the framework:

1. The different discourses of the field in terms of past knowledge, conceptual and theoretical understandings and previous experiences take the form of the theoretical input and/or state-of-the-art literature reviews in the papers,
2. The overall regulatory framework and the municipal allocated responsibility within, for each of the arenas (2nd order governance), and
3. The practices within the specific arena.

Chapter 6 on environmental regulation of companies departs from the latest decade's conceptualisation (discourse) of a change (or broadening) of regulatory focus and approach. The "new" "discourse" (not called this in the chapter) gives priority to pollution prevention, cleaner technology and input reduction rather than clean-up, dilution and end-of-pipe controlling of the local pollutants. The (regulatory) means to be applied should be smart and flexible rather than rigid, and further focus on encouragement before command and control. The old "discourses", however, still flourish. In the chapter I specifically look at how these "new" ideas have materialised (or not) in the Danish regulatory framework (2nd order governance in terms of the constituted framework). In the chapter I further discuss how the municipal officers in charge of the direct environmental regulation of companies in Denmark perceive their options and the challenges for actually implementing (applying) such broadened focus and approaches in their regulatory practices.

Chapter 7 departs from the same "energy gap" literature as chapter 5, but mainly as an argument for the need for political action and programmes to target the barriers. I look into the concept and argumentation for (discourse) of Energy Efficiency Obligations (EEO) and White Certificate schemes, and assess how the Danish scheme has been organised (2nd order governance in terms of the constituted framework). On that basis, the specific experiences from the Carbon 20 project about suitability for making synergies between this overall scheme and the municipalities' efforts to engage the local SME are discussed.

Chapter 8 departs from the discussions of the public – and especially local government's – role in business support, innovation and growth. During the last couple of years the public has been reintroduced to having a central role in the business development, innovation and growth e.g. concepts such as public private partnership and shared values (a current shift in discourses and understandings). In the chapter, I look at the significantly altered Danish institutional framework for business support, where the municipalities are suddenly centrally placed actors (the constituted framework). The paper showcases the way that some of the municipalities are beginning to use this altered role as a platform for a rethinking of other responsibilities in terms of establishing synergy for promoting business growth across typical municipal boundaries including e.g. public procurement as policy tool to motivate a change. As such the arena addressed in chapter 8 already represent an emerging merging of distinct arenas. This also implies an enlargement of both the relevant discourses as well as regulatory framework that are addressed. I discuss the merging of regimes of practise specifically in relation to the Carbon 20 municipality experiences (or practices) as highlighted during the specific exchange of experiences on the Green Growth agenda.

Chapter 6 and 7 are presented as article published respectively Journal cleaner Production (in press) and proceeding ECEEE industrial summer study 2012. Chapter 8 is a normal chapter. Equally to Chapter 5, 6 and 7, chapter 8 is presented so that it is possible to read rather independently from the rest of the PhD, even though more explicit reference to the introduced conceptual framework is applied.

THE MUNICIPALITY OPTIONS FOR IMPROVING THEIR PRACTICE AND OVERALL GOVERNABILITY

Having outlined both the challenges of the targeted companies and the various regimes of governmental practices within three different – and currently rather separate – arenas, I turn my focus to the learning perspective of the PhD in terms how the municipalities can enhance their competences to encourage companies to lower their GHG emissions and thus address the encountered challenges using whatever means available from the different governmental arenas.

As argued, there are attempts by some municipalities to work across these historically established boundaries of the political and administrative organisation in the municipality – an (emerging) merging of otherwise separate governmental arenas, where the green growth arena already point at some of this. This provides than an opportunity for the municipalities to redefine the previous practises within these altered settings.

Focus of attention is altered from an analysis of the constraining factors for the existing "regimes-of-practices" within these arenas, into a more forward-directed perspective of how the municipalities "best" can apply the combination of available

means, techniques and approaches from the different arenas that prove suitable for encouraging a charge by the targeted companies. The focus of attention is moved from municipalities' allocated responsibility within the vertically linked governance system and back towards the horizontal interactions with companies as the object of the governing activities.

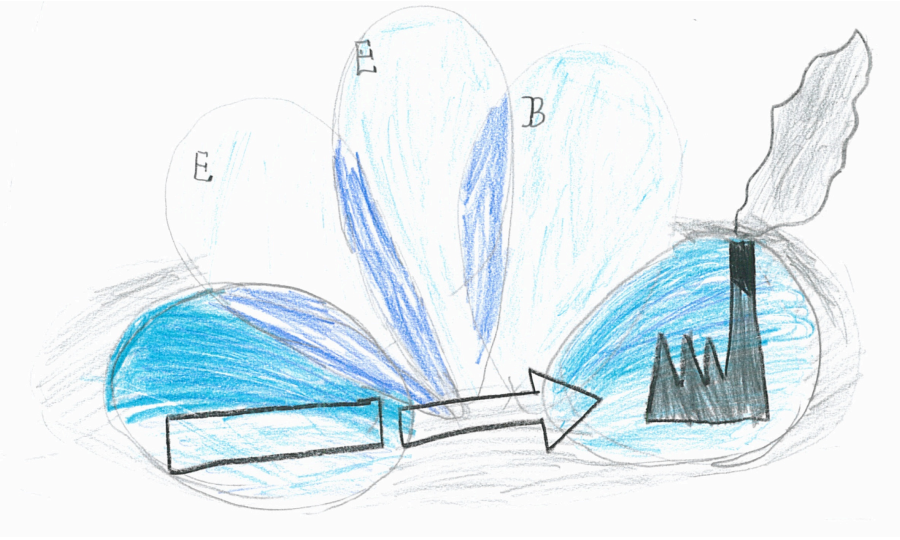
Chapter 9 consist of a first step in this redefining of the practises. It specifically analyse the learning of the municipality officers during the Carbon 20 project in respect to their competences to influence the companies. The chapter also departs from the "energy gap" literature. I find however that this literature tradition pays no – or very limited – attention to the abilities of the municipality – or any other second party for that matter – to facilitate the companies to overcome the identified barriers. I therefore draw on experiences from second party facilitation programmes of respective company implementation of environmental management systems and promotions of OHS improvements by companies (Malmborg, 2004; Broberg and Hermund, 2004) as well as the already used contributions of Schön and Argyris and their concepts of "reflective practitioner" and "double loop learning". The paper draws up a concept of the municipal officer as a "reflective dialogue partner" as an "ideal type" to frame a discussion of the competences and learning obtained through the project.

Chapter 10 further this analyse into a specific assessment of how than, the municipalities officers as a "reflective dialogue partner" can facilitate companies to address the types of challenges highlighted in chapter 5. By discussing the options of such a reflective dialog partners for addressing the challenges highlighted in chapter 5 across the arenas of chapter 6, 7 and 8, chapter 10 compiles the knowledge obtained from previous chapters (along with other knowledge) into a preliminary answering of the overall research questions by providing suggestions for how municipal officers can alter practise to influence companies.

Both chapter 9 and 10 is thereby an attempt to respond to the governmentality literatures pointing out that the establish way to do things – or the establish regimes of practices – is by no means the only way possible. Chapter 9 and 10 is my contributions to encourage the municipalities to form new regimes-of-practices in these merging arenas.

Chapter 9 is presented as article submitted to Journal of cleaner production, whereas chapter 10 is a normal chapter.

PART B. THE CORE ANALYSES OF THE PHD



CHAPTER 5. THE COMPLEXITY OF THE SYSTEM TO BE GOVERNED

This chapter is the first of the core analyses of this PhD thesis – part B. As explained the object of this chapter is specifically to assess the challenges encountered by the companies participating in the Carbon 20 project as an element in the horizontal interaction between the municipalities and companies.

The overall objective in respect to the PhD is to get insight into the specifics of the complex dynamics and variations of the system to be govern. For this PhD, the system to be governed is the local companies GHG emissions. The chapter provide insights into what constraints different companies for changing behaviour in respect to reduce their GHG emissions. This analyse is used as departure point for the municipalities to adapt their practise on how to address companies faced with the different challenges.

Focus of attention is narrowed down to discuss energy savings instead of the broader GHG emission reduction. This follows the Carbon 20 projects primary focus on energy savings in the preliminary screenings offered all the companies, whereas others GHG emission reductions solutions have not been addressed consequently at all companies.

The essential of this chapter consist of a "stand-alone-paper" submitted for the journal of Energy Policy on the 9th of March 2015. The vocabulary of the conceptual framework is therefore not applied specifically.

The paper is a further elaboration of a paper presented at the ERSCP 2013 conference in Istanbul (Dirckinck-Holmfeld, 2013) that also included the basic drafting for what is here developed into chapter 9 (paper 4 submitted to the Journal of Cleaner Production) and chapter 10. Some findings have earlier been presented in more preliminary forms in both the 2nd and final monitoring reports of Carbon 20 (AAU, 2013a; 2014)

5.1. PAPER 1: CHALLENGES FOR COMPANIES IMPLEMENTATION OF ENERGY SAVINGS

Challenges for Obtaining Business Energy Savings:
Results from a Local facilitation Program

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Abstract
Energy savings in companies are viewed effective to reduce Green House Gas emissions (GHG). Various barriers hinder the implementation of otherwise profitable energy savings. In this article SMEs challenges are presented as encountered during the Carbon 20 project.
Seven Danish municipalities have engaged 120 SMEs in reducing their GHG emissions with 20%. The enterprises have been offered energy screenings free of charge and an active facilitation by the municipalities during the subsequent implementation.
The objective is to empirically assess the character of the challenges as feedback to the municipal officers to adapt their facilitation strategies. The article is based on qualitative data asking the municipal officers' interpretation of the enterprises challenges instead of asking the enterprises own ranking of predefined barriers. The findings supplement the existing literature on barriers for implementing energy savings by applying different methods.
A myriad of different challenges are found for SMEs implementation of energy savings. The majority of these resemble categorisations of barriers highlighted in the reviewed literature.
The analysis of the statements reveals, however, that these challenges covers a diversity of different specific situations that calls for quite different approaches and means for how the municipalities can facilitate enterprises to address them.

Highlights
- A qualitative assessment of SMEs challenges for implementing energy savings are conducted
- The findings provides feedback to Danish municipalities facilitation strategies
- The findings align earlier quantitative surveys on the overall challenges encountered the most
- The statements still point at differences between related categories of challenges

- These differences are decisive for how to influence enterprises to address the challenges.

Keywords: Energy efficiency, Challenges and barriers, Small and Medium sized Enterprises (SME), Local facilitation programs, Green House Gas emissions

1. Introduction

Energy savings and energy efficiency improvements are claimed to be effective means to reduce GHG emissions. The International Panel on Climate Change (IPCC) argued in their 2007 report that energy savings in industry are cost-efficient means to achieve reductions of Green House Gas (GHG) emissions (IPCC, 2007).

Jaffe and Stavins (1994) argue that a gap exists between profitable energy savings and savings actually implemented. This gab justify that political actions are taking (Jaffe and Stavins, 1994; Paton 2001). Several scholars have provided input to explain this gap from both theoretical insight and from quantitative empirical surveys (Armstead, 2012; Brown 2001; Jaffe and Stavins, 2005; Fleiter et al. 2012; Lees, 2012; Thollander et al. 2007; Sorrell et al. 2011).

This article supplements this knowledge by a qualitative analysis of challenges that enterprises have encountered during participating in the EU Life+ project, Carbon 20 (LIFE09 ENV/DK/000366).

Seven Danish municipalities[32] and Aalborg University (AAU) have carried out the Carbon 20 project from 2011-2013. The project has engaged 120 Small and Medium Sized Enterprises (SME) to reduce their GHG emissions with 20 % during the period. This has covered a variety of enterprises from micro firms and shops with less than 10 employees, to larger productions sites (still within EU definition of SME), but also offices, restaurants and transportation business etc. See Figure 1 and 2

[32] Including Copenhagen as the capital, three suburb municipalities surrounding it (Albertslund, Allerød and Ballerup), and three middle seized municipalities - two in Jutland (Herning and Kolding) and one in West Zealand (Næstved)

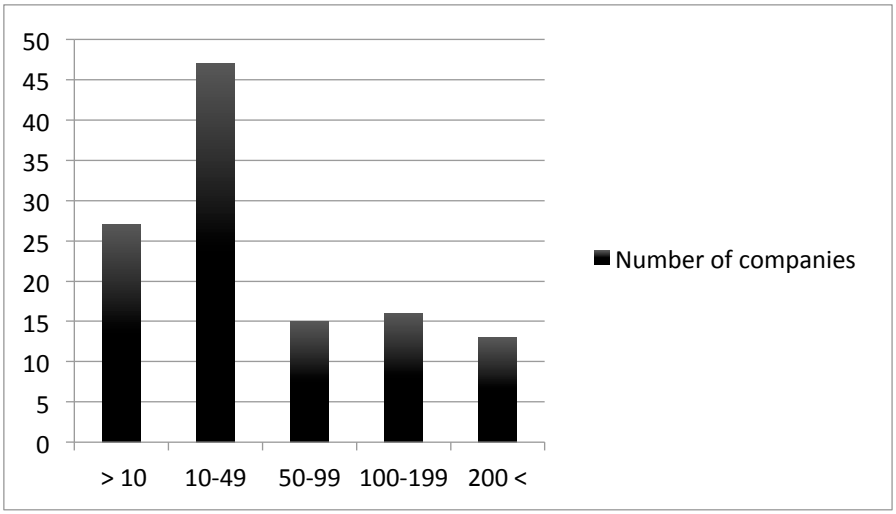

Figure 1 - Number and size of participant companies, Source: Own production based on data referred in Aalborg University (2014)

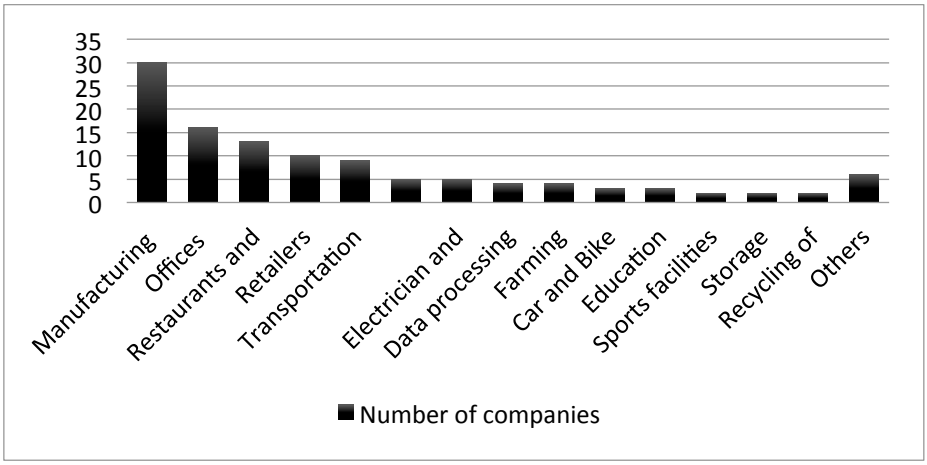

Figure 2 - Type of participating enterprises, Source: Own production Aalborg University (2014)

In the Carbon 20 project the municipalities offered the enterprises a facilitated process of: providing an initial screenings of possible energy savings free of charge; agreeing on relevant options for implementation; and subsequent follow-up visits on the enterprises implementation (see http://www.carbon20.dk/carbon20InEnglish/).

Thollander et al. (2007) point out that offering an initial screening free of charge influences the results of challenges as the purpose is to provide information that otherwise may be lacking (Thollander et al. 2007). The possibility of municipalities to offer such screenings is thereby a prerequisite for the findings of this article. The municipalities continued possibility for offering such is analysed in a previous paper (Dirckinck-Holmfeld, 2012), and will not be address further here.

The article supplements existing knowledge on challenges of enterprises for implementing energy savings. Most existing research is based on quantitative surveys of the enterprises' own ranking of different predefined barriers (e.g. Bradford and Fraser, 2008; Fleiter et al. 2012; Thollander et al. 2007). This article instead takes the municipalities' point of view and is based on their explorative statements of how they perceive the challenges encountered by the specific enterprises.

The objective is to gather insight into the character of the encountered challenges as feedback to how the municipal officers can adapt their facilitating strategies.

2. Methods

The empirical data has been collected in connection with monitoring the progress of the Carbon 20 project. In total three monitoring reports have been made covering respective 2011, 2012 and 2013. Data from the two latter forms the main empirical base of this paper (Reports available at http://www.carbon20.dk/Publikationer/).

As part of the monitoring process in 2012, environmental officers from the seven municipalities were interviewed face-to-face in form of either single interviews with key involved officers, or focus group interviews with all involved local officers. In the interviews, the municipal officers were asked about the progress of each participating enterprise including whether any challenges had been encountered.

For the final monitoring process in 2013, the key involved local officers of the project answered a questionnaire with open-ended explorative questions about status for each company including updates on encountered challenges. Some of the officers distribute some of the questions directly to the participating enterprises. Consequently, minor parts of the applied data are from enterprises directly.

These specific data are supplemented by observations and notes from other project activities during the three years period including: progress meetings with all partners of Carbon 20 and at the specific municipalities; various conferences and

workshops, specific interactions with enterprises and ad hoc interviews with them in prolongation.

The processing of data has taken "a grounded approach"[33] following three iterative steps:

1) Some overall categorisations of challenges were made in order to gather related statements. The preliminary categorisation where based on the insights from the discussions during the various Carbon 20 activities during the first two years as well as initial processing of 2012 monitoring interviews.
2) Inspired by a literature review on challenges, obstacles and barriers for enterprises implementation of energy savings (see section 3) this categorisation was adapted for the final processing of the data. The categorisation applied in this article is thereby based iteratively on both: the preliminary insights (step 1), and inspiration from previous literature (step 2).
3) In the processing of empirical data from both the 2012 monitoring interviews as well as the 2013 monitoring final questionnaire, the collected statements on encountered challenges by the specific enterprises was grouped into the established categorisations in an excel sheet covering also the participating enterprises size, type and GHG emissions.

The processing of the various related statements revealed, however, a need for a further elaboration and diversification of established categories as the challenges still diverted in respect to how the municipalities can facilitate companies to address and overcome such challenges. Subcategories were therefore established afterwards – however, not provided separate cell in the excel sheet.

This "grounded approach" departs from most of the previous contributions reviewed in next chapter by:

- Asking for qualitative, explorative and open-ended statements on perceived challenges, and

[33] A "grounded approach" means here that the categorisation departs from the empirical data rather than theoretical predefinitions – applying "bottom up" gathering of related qualitative statements in contrast to asking for ranking of predefined categories in quantitative surveys. Within the energy gab literature "bottom-up" is used with a specific different meaning referring specifically to one kind of energy data derived from specific companies in contrast to overall average energy data (e.g. Koopmans and te Velde, 2001), why the "grounded" term is applied here instead.

- Asking the municipal officers having the direct interaction with enterprises about their perception of the encountered challenges for the specific enterprises

Qualitative, explorative statements provide the opportunity to empirically assess, what is perceived to be the challenges at hand instead of "solely" confirming and quantifying any theoretical or other general predefined assumptions about the challenges.

Asking second parties involved specifically in the interaction with the enterprises in question provides an outsider judgement of the actual challenges for that company.

This opposite also has limitations in terms of being the author's judgement based on qualitative divert statements that already represent a second parts judgement of the challenges encountered by the enterprises.

All the empirical data collected is in Danish. The various citations of statements in this paper are the author's own translation into English. Unless stated otherwise, the citations of statements are from the interviewed officers from the municipal in question – either the face-to-face interview or qualitative questionnaire.

3. Result on the categorisation of challenges for energy efficiency in enterprises

In this section different previous literatures diverse overall categorisation of barriers; obstacles and challenges for implementing energy savings are highlighted. Subsequently, the overall categorisation of challenges applied in this article is presented.

3.1 State-of-the-art categorisations of barriers for energy efficiency in enterprises

Within the academic field of energy efficiency, a gap is found to exist between profitable energy savings and savings actually implemented – known as the energy efficiency gap or energy paradox (e.g. Backlund et al. 2012; Blumstein et al., 1980; Hirst and Brown, 1990; Jaffe and Stavins, 1994; Sorrell et al. 2004; Weber, 1997).

Jaffe and Stavins (1994) addresses this energy efficiency gap from a economical theoretical position pointing at various market failures that hinder actors to make otherwise rational choices of implementing profitable energy efficient solutions (Jaffe & Stavins, 2005; Jaffe and Stavins, 1994; Thollander et al. 2007).

Based on an extensive literature review of barriers for enterprises energy savings Sorrell et al. (2000) list 15 barriers related to four overall theoretical categories: 1) market failure; 2) other economic barriers; 3) organisational barriers and 4)

behavioural barriers (Sorrell et al. 2000; Thollander and Dotzauer, 2010). Sorrell et al. (2000) thereby enlarge Jaffe and Stavins (1994) perspective in respect to adding organisational and behavioural perspectives (Sorrell, 2003; Sorrell et al, 2000).

Compiling this earlier work, Sorrell et al. (2004) introduce what they frame as a basic taxonomy. They use this basic taxonomy for a review of different empirical based surveys of barriers for the implementation of energy savings by production companies (Sorrell et al, 2011).

The basic taxonomy consists of six categories (Sorrell et al. 2011 p. 6):

a) Risk (risk of closure and risk of introducing new technology)
b) Imperfect information including transaction costs,
c) Hidden costs including disruptions to production and staff replacement/-training;
d) Access to capital;
e) Split incentives where the investors cannot fully acquire the benefit,
f) Bounded rationality where constraints on time, attention and lack of the ability to process information etc. prevent individuals in charge to make "rational" decisions.

Sorrell et al. (2011) acknowledge that this taxonomy is to be understood as an overall theoretical framing of various barriers that might be framed differently, cut across or appear by other wordings in different contextual analyses of barriers. They attempt, however, to use their own taxonomy as base for "translating" the various categorisations of barriers found in the reviewed surveys into the same wording and compare, which barriers are found to be significant. They conclude that the barriers highlighted the most relate to "imperfect information". However they also found that such barriers appear interconnected to both "hidden cost" and "bounded rationality". Opposite they emphasise that few enterprises actually highlighted "split incentives" as a barrier (Sorrell et al. 2011).

Thollander and Dotzauer (2010) assess two Swedish surveys on energy savings in SMEs and non-energy-intensive industry (Thollander et al. 2007; Rohdin and Thollander, 2006). Based on these, they conclude that the five main barriers identified were (Thollander and Dotzauer, 2010 p. 1341):

- Lack of time or other priorities (including other priorities of internal capital funding)
- Lack of access to capital or funding
- Cost of production disruption/Inconvenience
- Technical risk such as risk of production disruptions
- Difficulties/cost obtaining information energy use of purchased equipment

In one of these surveys, the barrier "Lack of time or other priorities" was the only one pointed at significantly more than the rest (Thollander et al. 2007). Bradford and Fraser (2008) come to similar conclusions. In a survey of SME's in the United Kingdom 65 % of the respondents highlighted insufficient time or staff as the most important obstacles for not implementing energy savings. Opposite no significance could be registered in respect to other investigated barriers in that survey (Bradford and Fraser, 2008).

The surveys of respectively Thollander et al (2007), Rohdin and Thollander (2006) and Bradford and Fraser (2008) are all based upon local programmes that resemble the Carbon 20 by providing the enterprises an energy screening free of charge or highly subsidized.

Thollander et al. (2007) point out that offering a screening free of charge indeed influences the results. The purpose of offering screenings to the SME is precisely to address barriers related to "imperfect information". Exactly the one highlighted by Sorrell et al. (2011) as the barrier otherwise encountered the most (Thollander et al. 2007). The barrier "lack of time and other priorities" would in Sorrell's taxonomy relate to the "Bounded rationality" category found to coexist with the "imperfect information" barrier in Sorrell et al. (2011) review of various surveys.

In a Danish context, the Danish Society of Engineers (IDA), has asked several experts within the energy saving field about their view of barriers, constrains and challenges for the implementation of energy savings in production enterprises. IDA summarises this into 5 obstacles (IDA, 2012 p. 9):

1. Lack of economic incentives
2. Lack of knowledge about own energy saving options
3. The landlord has the cost, while the tenants the gains
4. When rules and legislation constrains energy savings, and finally
5. Lack of skills to maintain good habits

IDAs framing of the obstacles seem to divert some from the categorisation of both Sorrell et al. (2011) and Thollander and Dotzauer (2010). Four of the highlighted obstacles appear anyhow to concern some of the same aspect as appointed by the others, just using other wordings. Obstacle number four on rules and legislations differs however significantly in nature. Some – especially the more earlier – academic writings do also address such regulatory aspect e.g. Hirst and Brown (1990) and Weber (1997).

IDA's emphasis on the overall rules and legislation relates to a rather long tradition in Denmark of a strong regulation in the energy field including high levies and taxes on energy production and consumption. The discussion of the appropriate of

these settings and frames is an integral element of the Danish debate on energy efficiency.

3.2 The overall categorisation of challenges used in this article

Above, a selection of different contributions of categorisations of various barriers for companies' implementation of energy savings has been presented. As shown the different contributions came to somewhat different categorisations with overlapping wordings and boundaries drawn slightly different (see Table 1).

Sorrell et al. (2011; 2004)	**Thollander and Dotzauer (2010)**	**IDA (2012)**
Bounded rationality as constraints on time, attention and lack of the ability to process information etc. prevent individuals in charge to make "rational" decisions	Lack of time or other priorities (including other priorities of internal capital funding)	
		Lack of economic incentives
Hidden costs including disruptions to production and staff replacement/-training	Cost of production disruption/inconvenience	
Risk (risk of closure and risk of introducing new technology)	Technical risk such as risk of production disruptions	
Access to capital	Lack of access to capital or funding	
		Lack of skills to maintain good habits
Imperfect information including transaction costs	Difficulties/cost obtaining information energy use of purchased equipment	Lack of knowledge about own energy saving options
Split incentives where investors cannot fully acquire the benefit		The landlord has the cost, while the tenants the gains
		When rules and legislation constrains energy savings, and finally

Table 1 – Differences between different categorisations of barriers for energy savings.

The aim in this article is to provide input (feedback) to the municipal officers in respect to adapt their facilitation strategies. The term "challenges" was deliberately

chosen instead of barriers as challenges signal that these potentially can be overcome, whereas barriers appear as more permanent roadblocks.

As argued, the empirical statements have been gathered under some overall categorisations for further processing. The forming of these categorisations was as mentioned based iteratively on first the preliminary impressions from the two first years of the Carbon 20 as well as the above literature review of past contributions. In total six overall categorise of challenges were established. In addition tree supplementary "categories" was created for capturing respectively: statement falling outside these six, statements specifically highlighting that there were not encountered challenges; as well as no responses:

1. Lack of time and priority
2. Lack of ability to implement solutions
3. Economic constrains
4. Split-incentives between Landlords and tenants
5. Rules and legislation
6. Insecurity of new technology

- Other challenges
- Highlighted that no challenge and
- No responses

The majority of these categories do align the wordings of some of the previous literature, but do also divert in some aspect. This diversion follows from the preliminary empirical input during the two first years and will be elaborated further in the next analysis of the character of challenges in next section.

4. Discussions on the enterprises encountered challenges for energy savings during the Carbon 20 project

Previous contributions were presented in respect to challenges to the implementation of energy savings by enterprises in the last section. In this section two types of results are presented:

- Overall "quantitative" insights derived from adding the challenges to the general excel sheet, and
- The subsequent main qualitative analysis of the statements within each of the establish categories in respect to the character of the challenges.

4.1 The overall quantitative insights on the encountered categories of challenges

The statements on challenges encountered by the specific companies was, as mentioned, grouped under some overall categories in an excel sheet with

information on each companies in respect to size, type as well as their GHG emissions during the three years project period.

The overall figures of enterprises encountered the different overall categories of challenges are presented in Table 2 including information on the distribution on seize and proportion of the companies reach the target of 20% emission reduction.

Groups of companies	***No. of enter-prises***[34]	***Reached goal (20% GHG reduction)***	***Size***			
			<10	*10-50*	*50-100*	*>100*
All enterprises in Carbon 20	**120**	**53%**	**23%**	**39%**	**12%**	**24%**
1) Lack of time / prioritisation	55	49%	24%	40%	11%	24%
2) Lack capabilities	9	33%	22%	56%	0	22%
3) Economic challenges	38	47%	34%	45%	11%	11%
4) Landlord and tenants	24	38%	38%	38%	8%	16%
5) Rules and legislation	9	33%	22%	56%	11%	11%
6) Insecurity about new technology.	8	50%	25%	63%	13%	0
Other challenges	18	44%	11%	44%	17%	28%
Highlighted no challenges	23	78%	26%	39%	4%	30%
No responses	6	33%	17%	33%	0	50%

Table 2 - No., size and achievement of the Carbon 20 companies encountered the overall categorisation of challenges, Source: Own production based on project Excel sheet also referred in Aalborg University (2014).

As apparent in table 2, "lack of time" was clearly the challenge encountered the most by more than 45% of the participating enterprises, followed by "economic challenges" and "landlord and tenants" at respective above 30% and approximately 20% of the companies.

The article thereby confirms the findings of Thollander and Dotzauer (2010), as well as Bradford and Fraser (2008), that the challenge of "Lack of time" is the

[34] For several enterprises, the local officers have highlighted challenges related to more than one category. Likewise some challenges are interlinked, and the statements relates to several challenges. Therefore, the numbers do not add up.

essential challenge for SMEs. Equally, the challenges related to economic constrains followed second also align with the reviewed literature, which all emphasis varying aspect of economic challenges. The landlord-tenants challenges encountered the 3rd most opposite contradict Sorrels et al. (2011) findings that split incentives (covering landlords and tenants) are not significant.

Several of the statements covered that the companies hadn't encountered any challenges. Such information has often not been measured in most of the reviewed literature.

The various challenges under "other challenges" are adding up making this category significant. However, it covers quite different situations that neither shows any significance – all below 10% (see table 3). The rest of the overall categories are also encountered by below 10%. For especially "capability to implement solutions" and "rules and legislation" this was surprising, as these were intensely discussed during the two first years of the project.

In relation to the seize of companies, only some minor variations were registered in terms of higher concentration of the smallest companies for those encounter challenges related to "landlord-tenants" and "economic challenges" compared to the total figures of all participating enterprises. For the "landlord-tenant" challenges a significant diversion were noticed in terms of underrepresentation of production enterprises. This contributes to explain the discrepancies between this analysis and Sorrell et al. (2011), as the latter precisely did focus on production companies.

In respect to the proportion of enterprises reached the goal of 20% reduction in GHG emission, the enterprises encountered challenges in general have inferior achievement ratio. This mirrors also that the "no challenges highlighted" category show significantly superior reductions figures.

A closer qualitative analysis of the statements gathered under the categories revealed that the actual challenges of the single companies still varied – especially in respect to how much "attention" was needed from the municipalities to maintain the enterprises focus. The categorisation were therefore elaborated and diversified further – see Table 3 – but not added as separate categories in the excel sheet and therefore not part of the "quantification".

Groups of companies	*No.*[35]
All enterprises in Carbon 20	**120**
1) Lack of time / prioritisation	**55**
Motivated, but "forget it"	15
Lack of support management	3
Hampered by more urgent issues	28
Lack of commitment and motivation	9
2) Lack capabilities	**9**
Knowledge on specific solutions	7
Skills to implement the savings	2
3) Economic challenges	**38**[36]
Struggling for survival	8
Internal profitability of investment	11
Difficulty raising finance and capital	13
4) Landlord and tenants	**24**[37]
Split incentives – tenants	14
Split incentives – landlords	3
Temporalities of the rental	3
The municipality as landlord	6
5) Rules and legislation	**9**
Levies excess heat	4
Conservations rules	5
6) Uncertainty about new technology.	**8**
Other challenges	**18**
Part of branch or larger group	4
Dependent on 2nd parties	4
Have realised most easy savings	3
Are moving locality	3
Conflict other aspect (HQS)	2
Employee involvement	2
Highlighted no challenges	**23**
No responses	**6**

Table 3 - Challenges highlighted by officers for enterprises participating in the Carbon 20 project. Source: Own production

[35] Some companies highlighted more than one challenges or challenges that related to more than one categorisation. This includes also the created subdivisions. Opposite some of the statements were not possible to place within the created subdivisions. The counting in the subdivision does therefore not necessarily add up

[36] Especially for economic challenges, several statements only referred to economic constraints, whereas a subdivision haven't been made on those, why this number is higher than the sum of those below

[37] Some of the statements related to several subcategories e.g. having the municipality as landlord and being challenged by the temporalities of the rentals

Table 3 includes a (roughly) counting of the subdivisions. Some statements - e.g. some of those related to economic challenges – have not been possible to specify according to these subdivisions.

Below follows for each of the overall categories the reasoning for the overall framing, and the qualitative analysis of the character of the statements within the category triggering the further subdivision.

4.2 Specific insight on the category 1 "Lack of time and prioritisation"

The first category is inspired by the surveys of Thollander and Dotzauer (2010) as well as Bradford and Fraser (2008). They both emphasises that lack of time and other priorities are the biggest barrier for SMEs implementation of energy savings. Sorrell et al. (2011, 2004) term this as belonging to "bounded rationality" in terms of the enterprises are locked into specific understandings of, what their core business is and what makes them earn money.

During Carbon 20, the municipal officers generally highlighted that energy (savings) was not seen by the enterprises as related to their core business, whereas the external attention from the municipalities is viewed to be central for the enterprises to stay focused on this agenda.

The collected statements confirmed as mentioned "lack of time and prioritisation" as the most significant challenges for SME. The statements did however also reveal that the overall category covered several diverse situations.

Several enterprises were rather "self-propelled" in respect to implementing energy savings, but still needed a friendly reminder from now and then to stay focused. As an example:

> A good story! They have been active and sometimes even self-propelled, but the regular contact with the local authority has been important because it has helped them to keep focused on the issue (Copenhagen).
>
> Great credit to the municipality officers who enthusiastically have motivated us to keep focus to the project (an enterprise in Copenhagen).
>
> They are a busy small business with 6 employees, so they (or the manager) must constantly be approached to keep this focus - not because of lack of will, (but) simply because there are other things that are higher on his agenda. (…) They specifically express that it is appreciated that the municipality show interest for the enterprise and provide them a friendly kick in the ass from time to time (Allerød).

On the opposite, “lack of time” has also been used as an excuse for not having done anything in the project:

> We have several times tried to get the enterprise to install new lighting incl. even having arranged to gets vendors to provide a specific offer (...). But here in late August (2013) still nothing has happened. (They) do refer to business (as reason ... but) they basically has not shown any interest for the project. (...) To say it frankly ... It does not pay to spend too much energy on them (Copenhagen).

A few statements were related to situations, where the enterprises have a very engaged employee, but where implementation is hampered by lack of focus from top management:

> It has taking some time with them (...). Despite the fact that they have a large ISO certified environmental management system it is not a very high priority internally (…). It is a big system to put in place if you do not believe it! (...However it) seems that the participation and interest from the municipality actually helped the employee in charge getting the management’s focus and commitment" (Albertslund).

The majorities of statements gathered within this category did however relate to situations, where specific circumstances had hindered enterprises otherwise showing interest. Some circumstances related e.g. to employee situation (illness), busy with establishing a new production line as well as using all available resources and manpower in the struggling for survival – showing that the challenges often is interlinked:

> Because of long-term illness of a key employee, their participation is put on hold (Allerød).

> The energy project has been down-prioritized due to development of new product line, but they do regard the screening as a great tool and would like to implement the highlighted action in the future (Albertslund).

> It's probably those who are lacking most behind (...). So we keep approaching them (...) and they want to! But the problem is that they fight for survival! (....) It is not qualifications, but solely the time. And the economic situation too of course - but initially just finding the time (Allerød).

As these selected citations reveal, the challenges do relate to quite different situations. A further diversification of the overall category in terms of four sub-

categories was thus established in table 3 – calling for a subsequent stronger effort to motivate the enterprises.

4.3 Specific insight on the category 2 "Lack of capabilities for implementing highlighted options"

This second category did not appear from the literature review (in this wording), but has mainly been included based on discussions during the two first years of the Carbon 20 project. Especially Copenhagen has repeatedly argued that many of the smallest enterprises are lacking capabilities to implement the highlighted savings in spite of the provided screenings.

The investigation from IDA (2012) does address capability issues in relation to skills and knowledge, but applies both in a different way than articulated by the Municipality of Copenhagen. Equally, the barrier of "imperfect information" (Sorrell et al. 2011; 2004) also covers these elements, but more broadly.

Surprisingly few pointed at this challenge in the specific statements compared to the long debate during the first project years. The analysis of the statements reveals furthermore that only two of nine statements relate to what Copenhagen municipality addressed in terms of skills to implement solutions. The other statements under this capability to manage the implementation process, relate more to technical difficulties in respect to implementation of specific solutions that needed further analysis, additional knowledge and/or involvement of external partners. Actually, this resembles more the knowledge concern of IDA (2012) or imperfect information of Sorrell et al. (2011; 2004) than this capability aspect.

One of the two statements on the capability aspect reveals however that the challenge was partly overcome by appointing an intern in the municipality to address it and further that others could have had value of this.

> Here we have managed to get a "facilitator" attached, who has guided the implementation process. This has been crucial for the implementation of the various initiatives. Many others of the enterprises could have gained from this as well (Copenhagen).

Copenhagen did use the intern for a few other enterprises as well. This may explain some of the few highlights as it were overcome. The discrepancy to the intense debate during the first years is however still significant

4.4 Specific insight on the category 3 "Economic challenges"

The third category cut across several of categories of barriers suggested by Sorrell et al. (2011), Thollander and Dotzauer (2010) and IDA (2012).

Sorrell et al. (2011) has distinguished the economic challenges as being related to quite different barriers including risk (of closure), access to capital and hidden cost. The risk of closure is in this analysis understood as significantly different than the risk of introducing new technology, that in Sorrel et al. (2011) group under the same category of risk. Equal to Thollander and Dotzauer (2010) the technical risk is a separate category.

Thollander and Dotzauer (2010) and IDA (2012) point each at different economic challenges. Thollander and Dotzauer emphasises the lack of access to capital and funding, whereas IDA emphasises the lack of economic stimuli more broadly.

During the Carbon 20 project, the various challenges related to economic aspects have been discussed several times, but without any clear distinctions between the different characteristic of the actual challenges. Several of the collected statements only pointed at economic challenges generally without any further specification. However some did articulate differences calling for the subdivision into the three economic challenges mentioned in Table 3:

A) Struggling to survive

During the project one participating enterprise went bankrupt, while another almost had been closed down before sold. Several other enterprises experienced severe declines in orders during the financial crisis. Some enterprises are experiencing new orders, but some are still struggling for survival.

> At a follow-up meeting on the screening report, it was explained that the enterprise is shutting down June 2013. (Copenhagen).
>
> The financial crisis has been hard on the enterprise - they have had declines in number of customers and thus earnings (Allerød).
>
> They are challenged on the funding - they had problems during the crisis and still drags around with a financing deficit. So even though production is now going really good and is growing, they still have a funding problem because the conditions from a few years back. (Allerød).

B) Internal profitability

In the Danish energy saving debate, there has for several years been a high attention on simple return rates of investment – the payback period – measured by investment divided by annual savings from energy bill provided equal cost pr. unit energy. The energy consultants have at varied occasions in Carbon 20 argued that the average maximum payback time for enterprises investments in energy savings

used to be around 3-5 years, but have been lowered to around 2-3 years after the crisis. Equally, the payback time is generally perceived to be a barrier among the municipal officers.

This is partly contended in an assessment carried out by AAU on the suggested solutions in the screenings and implemented by the enterprises. The majority of all identified savings and those actually implemented have an estimated average return rate around 3,5 years – slightly higher than the articulated max three years. Assessing the data further revealed that no correlation could be observed between the options payback period and their degree of implementation. Some suggested solutions with the highest implementation rate had quite long payback time (some even above 10 years). Opposite, several with rather weak implementation rates had rather short paid back periods even within a year (see final monitoring report at www.carbon20.dk).

The collected statements reveal that several enterprises did have challenges in relation to the profitability of the suggested solutions in respect to internal decision-making. However, only a few did mention any specific payback times. The few, who did, operated with longer payback times than the proclaimed three years – at least for green investment as energy savings.

> There will not be any action taken. It was proposed to do something with the lighting, but it cost too much compared to the estimated savings (Allerød).

> They haven't encountered problems in implementing the initiatives, but it's hard to get allocated money for the major issues - the return period should preferably not exceed five years (Herning).

> The remaining initiatives are dependent on the return rates, which are usually maximum two years. However, green initiatives with a maximum return rate of up to five years can be accepted. But the economy is a limiting factor (Herning).

C) Lack of capital

In addition to the internal profitability and struggling for survival, several statements about economic challenges related to problems of raising the needed capital for the investment. Especially, the smallest enterprises encountered this, whereas the internal profitability aspect primary concern the bigger (medium sized) production companies.

Several did point at (increased) difficulties lending money, but the majority of the enterprises preferred to find the needed capital themselves. This seems however

difficult, whereas several lacked proper cash flow to take out the needed capital for investments. During the project, some of the smallest enterprises have attempted various means to lower the needed investment, e.g.: doing some things themselves, choosing the second best solutions, implement the solutions in stages etc. Some enterprises specifically suggested that projects like Carbon 20 should explicitly address the financial challenges:

> The replacement of the lighting in the shop window is only the second best solution. That was what the economy could bear (Copenhagen).
>
> Some of the solutions have taken a long time to realise. He have made several of the solution himself in order to save money (Copenhagen).
>
> They have spent DKK 25,000 to buy LED lighting (...), but it is still placed unpacked in the basement. They need another DKK 10,000 for the installation (...). They know that they can save more on their bills if the light is installed faster, but they still need to get the ends to meet during everyday life with payment of salaries, etc. (Copenhagen).
>
> They have great difficulties to borrow money for climate action. Despite a 17% increase last year, the bank will not help to invest (Allerød).
>
> Economy is a problem, e.g. in relation to investments in new machinery or ventilation. In a project such as Carbon 20, there should be allocated some money for the financing of the implementation e.g. through a fund or similar as an alternative to the bank when they will not lend the money (Company in Copenhagen).

4.5 Specific insight on the category 4 "Divergences between landlords and tenants"

The forth category of divergences between landlords and tenants has been addressed by both Sorrell et al. (2011; 2004) and IDA (2012).

Sorrell et al. (2011; 2004) address it as part of the barrier "the split incentives", which also covers other situations not related to landlord-tenant issues (e.g. procurement of product/equipment, different units within same enterprises etc.). As mentioned Sorrell et al (2011) finds that the split incentives have not been highlighted significantly. IDA (2012) addresses split incentives more specifically in respect to landlord-tenants and argues that in the Danish context, this is viewed as a significant obstacle because enterprises generally only rent their premises.

During Carbon 20, the divergences between landlords and tenants have been discussed a lot. The collected statements confirmed contrary to the findings of Sorrell et al. (2011) it to be a challenge encountered significantly – the third most.

The enterprises encountered the challenge did however divert from the overall distribution of all the participating companies in terms of being significantly underrepresented by production enterprises – exactly those in focus of Sorrell et al. (2011).

The majority of the statements did concern the split incentives as articulated by IDA, e.g.:

> This enterprise also rent their premises (...). They have the problem that their boiler is getting old. They are the ones paying for the heat, but they will not pay for a new boiler, as it will become an installation belonging to the landlords. (…) And I've seen the same problem in regular inspection visits of enterprises as well. E.g. some windows are almost about to fall out. The landlords will however not change them. He does not pay for the heat and cannot place the cost on the tenant (Allerød).

For few enterprises – especially the smallest – the challenges was articulated as more related to the temporality of the rental period (short term and/or insecure rentals), than such split incentives:

> A big problem for the store is that the landlord is very unstable. The property is on compulsory sale and has been heading that direction for a while. This means that no one can be contacted for things like heating and replacement of windows. And it makes investments uncertain as the property can be sold at any time (Copenhagen).

> It is not expected that the enterprise will continue to work as their rental agreement is terminated at the end of 2013. The motivation to implement the proposals is thus limited (Copenhagen).

The statements gathered did also encompass the split incentives from another angle. A few participating enterprises are smaller "landlords", and statements related to these enterprises did also point at split incentives as a challenge – but in relation to get the tenants to act on the agenda.

> There is a potential for savings in behavioural change by the tenants (...). But it is a challenge, as the tenants usually pay rent incl. energy. So they have no incentives to save energy. And it is actually difficult to address this without going to sound money-grubbing, as their saving will benefit the "landlord" (Copenhagen).

Some of the statements on this landlord versus tenant issue related to enterprises having the municipality itself as the "landlord". This distinction is important as the role and options for officers to address the "landlord" is altered significantly as the one part is a different internal unit. The majority of these enterprises are placed

within the "Meatpacking District" in Copenhagen and as such is rather unique. Similar situations may however exist in other municipalities.

The "Meatpacking District" is listed as preservation worthy and thus under certain restrictions in terms of changes. This was discussed at several occasions in Carbon 20 (see next sub-section). The collected statements revealed, however, that the challenges encountered to a large extent related to discrepancies and controversies between the tenants and Copenhagen Municipality as landlord. Several of the five enterprises' primary reason for participating in the project was to use it as an opportunity to rearticulate focus on the need for a proper energy renovation of the district – addressing both the preservation aspect, but first and foremost as a new entrance to address the municipality to take action:

> Regarding cooling: nothing has happened, due to the municipality's unwillingness to choose the environmental right solution. So we continue for the next many years with an old-fashioned and very inefficient cooling system. We even had the means to invest in our own modern local cooling system that would have reduced CO_2 emissions by up to what is equivalent to the annual energy consumption of 150 households', but this is hampered because we are obliged to use this collective cooling system (Enterprise in Copenhagen).

> The enterprise had already implemented most of "the low hanging fruits" from the beginning of the project, especially with the restrictions provided by the conservation rules. (…). Their main incentive to participate in the project has thus probably been, as others in the Meatpacking District, to put pressure on the municipality (Copenhagen).

4.6 Specific insight on the category 5 "Rules and legislation that hinders implementation"

The fifth category is adopted from IDA and relate to the institutional settings and the Danish context. Denmark has had a strong regulation of the energy sector for a long time including high taxes and levies.

During Carbon 20, several discussions were related to the Danish institutional frames. Two of these discussions related specifically to challenges of enterprises in implementing the energy savings under the set-up of the Carbon 20 project. These concerned respectively "levies on regenerating of excess heat", and "restrictions on listed buildings".

The broader wording of "rules and regulations" was applied instead of having each as separate category. They do differ significantly in content, but actually have some of the same implications for the municipalities in terms of how to address them.

Equal to the capability challenge, rather few statements did however highlight these challenges.

During Carbon 20, especially the levy on excess heat had been addressed repeatedly as a significant challenge mirroring an intense national debate on this topic. Several group of actors have argued that levies on excess heat are hampering a more widely adoption of heat recovery. Oppositely, the Danish Energy Agency (ENS) argues that the levy is both necessary to counteract other undesirable effect, and furthermore has little influence on the profitability of heat recovery projects especially after some altering during 2013 (Viegand & Maagøe and SRC International, 2009; Skatteministeriet og Energistyrelsen 2006; Viegand & Maagøe 2013).

In Carbon 20, it was preliminary considered to make it a political issue to lobby for changes in the levy framework. This was however dropped as the approached enterprises refrained to participate. In the end, only at four enterprises this was highlighted as a challenge – and only as a contributing element, whereas other e.g. technical aspects were seen as equally challenging.

> They might however eventually try to find a solution where the heat from the ground water cooling system can be used in the district heating system. However this is dependent on among others the levies, which means that this can only happen in connection with replacement or renovation of the ventilation (Ballerup).

The conservation rules only related to the five participating enterprises located in the "Meatpacking" district in Copenhagen mentioned in last subsection. The challenge is that these rules provide restrictions in terms of acceptable changes to the building, which hamper some energy saving solutions. Such conflict is plausible for several listed buildings as they are often rather old and poorly insulated, but highly regulated in their appearance.

4.7 Specific insight on the category 6 "Uncertainty of new technology"

A number of statements related to the enterprises uncertainty about introducing new technology.

Contrary to previous categorisation, the statements gathered were much more uniform in character. They did vary in respect to different technologies, even though LED lighting dominated. LED was also the solution both suggested and implemented the most during Carbon 20 (see final monitoring report at www.carbon20.dk).

> Replacement of the lighting is put on hold. The company doesn't find that there is enough security that the brightness will last. The company keeps an eye on developments (Albertslund).
>
> She had experience with lighting before. She considers it a jungle. There are constantly new bulbs, which should be a little better. (…) Therefore, she will study the market very closely before she invests in new lighting throughout the store (Copenhagen).

4.8 Specific insight on the "Other challenges"

In addition to the above gathered statements, several statements from the last monitoring process of 2013 pointed at challenges not related to the previous established categorisations. These were thus collected in this "Other challenges" category. The analysis of these statements revealed that they related to quite different challenges, but also allowing grouping these into six subcategories:

1) Restrictions being part of branch or chain

Some statements concerned enterprises as part of a larger group, which had experienced challenges in respect to: restrictions due to chain and/or franchise concepts, and challenges in respect to lengthy decision-making procedures. In Sorrell et al. (2011/2004)'s taxonomy this would be a subcategory of split incentives and thereby adding to already highlighted discrepancy of this study compared to the findings of Sorrell et al. (2011) in respect to split incentives not being a significant barrier.

> When a supermarket, you are also covered by some chain aspects that limits your possibilities (Ballerup).
>
> They are headquartered from Germany. There is a long way up the decision-process – so they are first now mid 2013 beginning to implement solutions (Ballerup).

2) Dependent on 2nd parties in terms of supplier or district heat distributor

Some statements revealed that the enterprise in question have been dependent on second parties that hasn't delivered. This has e.g. concern specific supplier that didn't have the necessary knowledge about energy aspects. Again equal to elements of Sorrell et al. (2011/2004)'s barrier of split incentives.

3) Have realised most of the low hanging fruits

For some it were stressed that it was a challenges to actually provide any good solutions for the enterprises in question as most of the low hanging fruit has already been realized.

4) New buildings

A few companies were in process of moving and had little motivation for improvement of old building, but opposite did put emphasis on energy aspects in construction of the new.

5) Divergences to other considerations such as QHS

A few has highlighted some divergence between the suggested energy saving solutions and other considerations – e.g. in respect to Quality, Health and Safety (QHS).

6) Employee involvement

A few highlighted that the enterprises have difficulties in engaging the employees to alter behaviour in terms reducing energy consumption. This clearly relates to Sorrels behavioural challenges, but again rather few.

4.9 Specific insight into situations of no information available on encountered challenges

For quite many of the participating companies, no information was available about any encountered challenges. This lack of information covers however two distinct situations:

For rather few of the enterprises, the lack of information was due to no responses on the topic.

For the majority of the enterprises – almost 20% of all companies participating – the "lack" of information derived from a perception of the local officers that no challenges have been encountered, whereas they specifically have stated such or similar for the specific companies; a positive statements of no challenges.

> Running good - all proposed solutions are implemented during a very short time without any challenges (Allerød).
>
> Also one of those where it just work (…) As long as they can see a rationality in terms of financial savings they just implement the solutions (Allerød).
>
> The task is implemented (Herning).
>
> She has implemented all the initiatives in the action plan. She has not experienced any problems with this (Copenhagen).

> The company are for sure going to keep prioritising energy savings as well as the fruitful cooperation with the municipality (Næstved).

This marks a significant finding in respect to information often not covered by the reviewed literature. The interviewed municipal officers find for quite many enterprises (almost equal to the "landlord-tenant" challenges) that they haven't encountered any significant challenges for the implementation of the highlighted solutions.

5. Conclusions and policy implications

Energy savings in enterprises are generally viewed to be effective means to cut GHG emissions. A gap of untapped potentials exists due to diverse challenges and barriers for implementing profitable solutions. Different policy tools have been applied to overcome these barriers including local programmes aiming at facilitating changes among the SME. In this article is analysed the challenges encountered by local SMEs during one such project, the Carbon 20.

The purpose has been to provide the municipal officers with an overview of the character of the various encountered challenges as departure point for discussing, how they can influence enterprises to address them.

In contrast to most of the existing literature, the prime informants are the municipal officers interacting with the companies. The article thereby relies on a "second hand" view of the encountered challenges rather than the enterprises' own perception. The analysis further adds to the existing literature by relying on explorative investigations rather than surveys on predefined challenges allowing to empirical qualify the character of the challenges.

In the analysis, six overall categorisation of challenges for energy savings by enterprises were establish as well as three supplementing categories to catch statements falling outside these. They were established based on an iterative process including 1) preliminary input during various discussions in the projects two first years and 2) a review of previous literature. These categorise were uses as overall grouping in the processing of the qualitative statements collected during the second and final monitoring processes.

The analyses carried out showed that most of the articulated challenges indeed resemble the learning from the literature review, but also that some challenges are closely linked to the specific local settings and the Danish context.

A "quantification" analyse was made on the overall categorisation that confirmed earlier findings in the literature that "lack of time and priority" is the challenge highlighted the most by SME in a setting, where energy screenings are offered free of charge, and economic challenges as also significant.

Contrary to the literature review, this analysis also showed that challenges related to split incentives between “tenant and landlord” were encountered significantly as the third most. The earlier analysis did however looked only at production companies, which exactly were underrepresented among the companies encountered this challenge during Carbon 20.

The “quantitative” analysis revealed further that some highly debated challenges during the course of the project e.g. “skills to implement highlighted savings“ and ”levy on regenerating of excess heat” were not highlighted specifically for that many enterprises. This points at a gap between the overall perceived challenges and concerns, versus the actual highlighted challenges in respect to the single enterprises.

The closer qualitative analysis of the statements under each of the established categories revealed that the challenges grouped under same overall headlines did concern diverse situations calling for quite different influencing strategies by the municipalities.

Each category was therefore subdivided accordingly resulting in further diversification of the challenges that SME can face in the implementation of energy savings highlighted through energy screenings. This calls for a differentiated and adaptive facilitating strategy by the municipalities or other facilitators. There are for example significant differences in how to approach respective: enterprises already implementing most solutions, but still emphasises that time has constrained them from doing more; versus enterprises basically not interested in the agenda but still point at “lack of time” as the challenge.

Several of the statements pointed out that no challenges had been encountered for the specific companies. Information that most reviewed literature did not address at all.

The overall objective of the analysis has been to highlight the challenges as feedback to the municipalities in respect to improving their facilitation of energy savings. The main findings in terms of policy implications for such local programmes are:

- Time constrains and economic challenges are encountered quite often, why facilitating programmes targeting SME should attempt to address such.
- Similar challenges can take significant different appearance; some may prove to be excuses while others represent a high commitment.
- The challenges are often interlinked in terms of time, economic constrains and other challenges

- As the challenges for the single companies are unique, the actual facilitation of implementation calls for a flexible, differentiated and adaptive approach – not one size fit all.
- For some challenges – e.g. survival and/or no commitment – there may not be any good available voluntary means for municipalities to address these companies
- The split incentives between landlord and tenants are in a Danish context relevant to address especially in relation to smaller non-production enterprises
- Few other contextual challenges were highlighted related to the rules and legislation that pointed at different type of actions.
- In spite of offering the screenings free of charge, challenges related to lack of information and skills to implement the solutions still flourished among the smallest companies.
- These challenges were more related to technical knowledge than skills, including insecurity of whether suggested solutions are suitable. The skills aspect was, however, also partly addressed specifically during the project.
- Almost 20% hadn't encountered challenges at all. This could be used for further such cooperation e.g. to expose their success stories and/or enlarge their focus on improvements e.g. into product design and development as well as the resource and waste prevention agenda.

In this article, a departure point is given for discussing how the encountered challenges for energy savings provide valuable feedback for the municipal officers in order to adapt their facilitating strategies. It has not been within the scope of this article to discuss, what the municipalities actually can do to address these challenges. This is further analysed in another context (Dirckinck-Holmfeld, 2015).

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CHAPTER 6. THE ARENA OF DIRECT ENVIRONMENTAL REGULATION OF COMPANIES

This chapter is the fist of three that moves attention to the governmental system – the vertical linkages. As argued these three chapters each addresses the municipalities' regimes of practises within a specific Governmental Arena of interest in this PhD – here the direct environmental regulation of companies. In this chapter focus is on the different discourses dominating the field of environmental regulation of companies, the Danish governmental frames and institutional settings (2nd order governance) as well as the specific municipalities' practise and the applied means and governing techniques. The analyses of the specific practises compared to the discourses, is used as base for critical feedback on the governmental framework of the arena.

This chapter also takes the form of a "stand-alone-paper", which has been published in *Journal of Cleaner Production* (In press) and is here reprinted from http://www.sciencedirect.com/science/article/pii/S095965261401364X with permission from Elsevier.

As explain in Chapter 4 this imply that the paper does not use the specific wording of Governmental Arena, discourses, regulatory framework (2nd order governance) and regimes of practise and governing techniques. Chapter 11 will follow up on the conclusions in respect to the conceptual framework and relate the conclusions of the papers to the vocabulary introduced in chapter 3.

The article is a further elaboration of a draft paper presented at the GIN 2012 conference in Linköping (Dirckinck-Holmfeld and Smink, 2012). Some of the insights of the article have in earlier versions been discussed in the first monitoring report of the Carbon 20 project, AAU (2012). Some main conclusions are also referred in a chapter for a Danish book – Remmen et al. 2015 (reprinted in this PhD as Annex B).

6.1. PAPER 2: THE OPTIONS OF LOCAL AUTHORITIES FOR ADDRESSING CLIMATE CHANGE AND ENERGY EFFICIENCY THROUGH ENVIRONMENTAL REGULATION OF COMPANIES

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The options of local authorities for addressing climate change and energy efficiency through environmental regulation of companies

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ABSTRACT

Environmental regulation of companies is sometimes in the literature characterised as a successive broadening of focus and policy instruments: from applying command-and-control mechanism to get companies to clean and/or dilute local pollutants through end-of-pipe solutions; towards applying various means to influence and facilitate companies to act proactively in preventing pollution through cleaner production, waste prevention and resource efficiency.

This understanding is contested in this article. The article documents instead a gap in respect to the local authorities actual execution of the direct regulation of companies in Denmark. The practice of the local competent authorities is found to primarily still target local environmental concerns by command-and-control means.

The objective of the article is to analyse this discrepancy between the overall representation of regulatory trends and the actual practices of local authorities in Denmark. The overall constraints that local authorities encounter are investigated in respect to: 1) Addressing energy efficiency and reduction of GHG emissions through juridical requirements in permits and injunctions, and 2) Facilitating and promoting reductions of energy consumption and GHG emissions during inspections.

The assessment is based on the triangulation of different data: a) qualitative interviews with environmental officers from seven local authorities taking part in a EU life + project, Carbon 20; b) a documentary review of political documents and evaluations of the Danish regulations; as well as c) an interview and subsequent correspondence with an employee at the Danish Environmental Protection Agency.

1. Introduction

The environmental regulation of companies is often characterised as evolving through a successive broadening of policy approach and focus – both internationally and specifically in Denmark (Jørgensen, 2009; Keijzers, 2000; Klemmensen et al., 2007; Kørnøv et al., 2007; Long, 2001; Remmen, 2001; Schroll, 1997):

- From applying command-and-control mechanisms to enforce companies to clean and/or dilute local pollutants through end-of-pipe solutions,
- Towards using various means to influence and facilitate companies to act proactively to prevent pollutions through cleaner production solutions, waste prevention, resource efficiency, etc., and also targeting global impacts such as climate change.

This understanding is contested in this article. A discrepancy exists between this representation and the actual execution of direct environmental regulation of companies in Denmark – at least as performed by the local authorities (the municipalities), who have jurisdiction over the majority of smaller and medium-sized companies in Denmark.

Up to the millennium, Denmark was in general viewed to be heading this transition. Cleaner technology was included in the guiding principles of the law (Environmental Protection Act) and comprehensive cleaner technology programmes supported several diverse activities for a broader uptake of cleaner technologies, environmental management and even cleaner products – also the local authorities active participation in this.

Petersen et al. (2007) argue, however, that a significant breach in the overall environmental policy arose around the millennium.

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The environmental problems were perceived as exaggerated and/or resolved. Focus therefore shifted into streamlining the regulation in terms of both lower the "burdens" for companies and streamlining the administrative resources used (Petersen et al., 2007; Remmen, 2001; Røpke, 1997; Schroll, 1997).

A renewed analysis of the specific regulatory framework for the direct regulation of companies is presented in this article in light of this breach around the millennium.

The point of departure is taken in the tree year "Green City" project, Carbon 20. Carbon 20 specifically addressed the role of the local authorities in influencing companies to reduce energy consumption and GHG emissions (http://www.carbon20.dk/carbon20InEnglish/). During the first year, the options of the local authorities for addressing energy and GHG emission as part of their direct regulation of companies were discussed repeatedly. These discussions revealed a discrepancy between the principles of focussing on pollution prevention and global environmental concerns, and the actual focus of the local authorities.

Jänicke (2008) has from an Ecological Modernisation perspective characterised such discrepancies as an implementation gap. He explained such by resistance from the "old" industrial "*modernisation losers*" (Jänicke, 2008). Mortensen (2000) as well as Jørgensen and Lauridsen (2007) have provided a supplementary explanation to such gap. They specifically point out that the regulatory framework is a blurred mixture of different regimes and understandings (Mortensen, 2000; Jørgensen and Lauridsen, 2007). In 2012, a "Business Committee on Green Transition" appointed by the environmental minister equally find that the Danish regulation is blurred in terms of being inconsistence to the overall EU regulatory set-up (Erhvervspanelet for Grøn Omstilling, 2012).

This article supplements the above perspectives through a closer, detailed analysis of local officers possibilities for addressing reduction of energy and GHG emissions within the Danish regulatory framework for the direct regulation of companies. The departure for this analyse is a question of why such an "implementation gap" still exists in Denmark almost 25 years after pollution prevention was included as the core guiding principles of the Danish Environmental Protection Act.

Next section is a presentation of the method applied. In Section 3 the academic discussions of the change towards pollution prevention strategies is presented together with an update on the Danish overall regulatory framework on direct regulation of companies. Section 4 is a presentation of the main findings from 3 separate analyses carried out on respective: interviews of local environmental officers, documentary review, and interview and correspondence with officers in Danish EPA. These three analyses are combined in Section 5 into one assessment on options and constraints for competent authorities to address energy and climate within the Danish regulatory framework. Section 6 is the overall conclusions.

2. Methods

The point of departure for this article is a EU supported Life + Project, "Carbon 20". The project was initiated and carried out primarily by seven Danish municipalities forming the collaboration Green Cities, where each municipality has committed itself to reduce the GHG emissions of the municipality by 20%. As element to achieve such, the Carbon 20 project concerns specifically the participating municipalities' attempt to influence energy and GHG reduction amongst local companies (see more on http://www.carbon20.dk/carbon20InEnglish/).

The author has participated in the project, and has been engaged in several meetings, competence-building activities and participated during specific interactions with companies, as well as being in charge of a yearly project monitoring.

During the first year, the municipal officers' possibilities for addressing energy and GHG emissions as part of their direct regulation of the local companies were discussed repeatedly. In the first monitoring report in 2011 this issue was therefore addressed specifically and interviews with officers from the seven municipalities were conducted.

The focus of this article is on the municipal officers' perceptions of possibilities and constraints. The emphasis is therefore on how the regulatory framework is understood by the local officers, who actually are the ones implementing the regulation. How the regulation was formulated and the relations between the national and EU level are only briefly touched upon in the article.

Furthermore, the discussion focuses on enlarging the environmental regulation and enforcement towards energy and climate change. In prolongation, the discussions in the Carbon 20 project and in other municipalities have also expanded into addressing other sustainability concerns and efforts to work across traditional professional boundaries. This is out of scope for this article, but is addressed in other parts of my PhD thesis (Dirckinck-Holmfeld and NN, 2015).

For the purpose of this article a total of 15 local officers were interviewed from the seven municipalities. At four municipalities, these interviews were conducted as a focus group interview with some of the involved environmental officers in the municipality (between two and six officers). In the rest of the municipalities, the interviews were single interviews with the environmental officer in charge of the Carbon 20 project locally. The interviews were structured around predefined themes and possible guiding questions. The questions asked included both overall open-ended questions, but also some more specific questions to get the officers to respond on certain topics and explain earlier answers.

Supplementing the data from these interviews, a parallel desk study has been conducted of several Danish political documents on the topic in respect to two aspects: Firstly, an assessment of primary legal texts (acts and orders), administrative guidelines and overall presentation in respect to the update of the overall regulatory framework. Secondly, an assessment of policy documents, political agreements, committees recommendations, as well as different evolutions of the scheme carried out during the last decades – several on behalf of or supported by Danish EPA. This latter review of these recommendations and evaluations etc. form a second analysis of judgements on the possibilities to address cleaner technologies, waste prevention, resources and energy etc. during direct regulation of the companies.

Finally, an interview with an employee at the Danish Environmental Protection Agency (Danish EPA) was conducted in order to have his view on the overall frames and comments on the view of the local environmental officers as well as insight of possible near future changes within the regulatory set-up. This interview subsequently led to correspondence with the interviewee and his colleagues from the Danish EPA, including the juridical units. This correspondence specifically concerned the possibilities for addressing energy as a topic under a new requirement to carry out inspection campaigns.

The findings of this article are thus based on a triangulation of the data input. This relates both to: applying different methods, as well as applying two different perspectives of respective the local officers and perspectives of Danish EPA. Three interrelated analyses are carried out in respect to these data:

- Analysis of the interviews with local officers participating in the Carbon 20 project on their perceptions of possibilities and constraints for addressing energy and GHG emission as part of the direct regulation of companies

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- A documentary review of past political documents and evaluations that make judgements on the possibilities for addressing pollution prevention etc., as well as
- Analysis of the interview with an officer in the central administration of the Danish Environmental Protection Agency (EPA) and the subsequent correspondence with him and other colleagues.

The result of these are presented as three separate subsections (Section 4) and then combined in an integrated assessment (Section 5). The next section sets the scene for these analyses by presenting the Danish regulation in light of this "new" pollution prevention regulatory approach.

3. The Danish regulatory framework and pollution prevention strategies

The purpose of this section is to set the scene in respect to the Danish regulatory framework and the concept of pollution prevention. The section includes: 1) A short presentations of both Danish and other academic writing on the suggested enlargement of the regulatory approach towards pollution prevention etc., and 2) An overall presentation of the Danish regulatory framework for the direct environmental regulation of companies.

3.1. Pollution prevention on the agenda calling for a new regulatory approach

In the 1970s, environmental problems were regarded as the unfortunate side effects of economic growth. Environmental regulations focused on damage control: on repairing and setting limits to harmful activity, end-of-pipe cleaning and diluting technologies, and clean up strategies. In other words, business-as-usual plus some add-on technologies (e.g. treatment plant or building the chimney higher) were regarded as being appropriate (Smink, 2002). To a certain extent, these public environmental regulations have been successful in the reduction of environmental problems: air and water quality improved significantly, smog levels were reduced and the visible pollution of surface waters has largely disappeared in western regulated countries (Keijzers, 2000).

These preliminary regulatory means, however, in many ways proved to be insufficient. Diluting only worked to a certain extent and for particular pollutants, whereas some cleaning technologies moved the pollutant from one media to another (Klemmensen et al., 2007; Long, 2001; Røpke, 1997).

Relying on add-on technologies and solutions has further led to additional costs for the companies and thereby contributed to a general perception of a latent conflict between economic growth and environmental protection, whereas environmental regulation is viewed as hampering private economic development (Klemmensen et al., 2007).

This view has been contested through the years by concepts such as 3M's Pollution Prevention Pays (dating back to 1975), UNEP on Cleaner Production (from 1989) and World Council on Sustainable Business Development's (WCSBD) on eco-efficiency (1992) (Klemmensen et al., 2007). All these concepts emphasises that win-win possibilities could exist between environmental and economic gains (or a double dividend as termed by Porter and van der Linde, 1995) if environmental considerations are integrated into the production processes and business strategies and not added on in an ad-hoc manner (Klemmensen et al., 2007).

In prolongation of such altered understandings with concepts of cleaner production and pollution prevention, several scholars call for and see a change in regulatory approaches towards, what have been framed as smart regulation (or related terms such as responsive or reflexive regulation and more recently also "regulatory arrangement approach"). This basically refers to applying a variety of means that inspire companies to improve their environmental performance through such integrated technologies, as contrast to rigid command-and-control of inflexible norms and standards pointing at specific end-of-pipe technologies (Ayres and Braithwaite, 1992; Jänicke, 2008; Klemmensen et al., 2007; Porter and van der Linde, 1995; Remmen, 1997; Van Gossum et al., 2010).

Already in 1997 Røpke conceptualised this as a successive evolvement of the environmental regulations through several development stages (Røpke, 1997):

1. Diluting in terms of "the long pipes politics"
2. Cleaning in terms of politics centred on controlling the pollutants, which however mainly results in transferring the pollutant to other media.
3. Prevention in terms of politics promoting the recycling and application of cleaner technology and environmental management systems inside production processes.
4. Extended prevention in terms of policies directed at encouraging pollution prevention throughout the whole lifecycle of products.

3.2. The Danish regulatory framework – inclusion of pollution prevention

Around the millennium, several Danish academic contributions suggested that Danish regulation was well on track towards implementing such pollution prevention regulatory strategies (Remmen, 2001; Schroll, 1997). Røpke (1997), for example, argued that Denmark was somewhere in the transition from stage two to three in the above presented general conceptualisation of the development of the environmental regulation, but also that Denmark already had some preliminary focus on lifecycle considerations of stage 4 (Røpke, 1997). Petersen et al. (2007) showed however that a significant change had occurred around the millennium. A change of government allowed for a growing perception that environmental problems were exaggerated and/or resolved. Focus was put on streamlining the regulatory framework in terms of both administrative resources spent as well as lower the "burdens" of companies (Petersen et al., 2007). This subsection introduces first the 1990s adaptations pointing towards pollution prevention. It than highlights the updates made since the millennium.

During the 1990s several aspects of the Danish regulatory pointed at an enlarged focus on pollution prevention:

Denmark adapted in 1991 the Environmental Protection Act to include pollution prevention, waste minimisation, the efficient use of resources and cleaner technology (later BAT (Best Available Technology)) as the basic principles for the administration of the act and carried out a series of different activities centred on such ideas (Moe, 2000). This was prior to EU's directive on Integrated Pollution Prevention and Control (IPPC) of 1996.

Similarly the Danish government implemented from 1987 to 2002 a series of cleaner technology programmes supporting the development of new technologies, concepts and tools for implementing pollution prevention including also a product lifecycle perspective. Originally, the idea was to link this development of the cleaner technologies to a periodic update of regulatory norms and standards. Such a clear link was never established. Instead cleaner technologies should be addressed as part of the permitting process (Andersen and Jørgensen, 1995; Environmental Protection Agency, 1993; Kromann et al., 1996; Ministry of Environment, 2010; Mortensen, 2000; Remmen, 1998, 2000; Remmen et al., 2014).

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Several local authorities were involved in initiatives under these related to promoting the uptake of cleaner technologies and environmental management systems (EMS) as a supplement to their direct regulation of companies, including: Public–private networks promoting and facilitating implementation and providing input to EMS schemes, as well as periodic action plans for implementing cleaner technology as part of permit conditions for companies (Bauer et al., 1998; Forman and Jørgensen, 2004; Kromann et al., 1996).

The inspection was also altered from a reactive to an active inspection; meaning proactively visits to companies rather than just reacting at complaints or other indications of non-compliance. A minimum frequency was introduced along a fee related to specific categories of companies. The scope was further broadened from solely monitoring and enforcing compliance to also promote environmental improvement beyond compliance. The first inspection guide (1995) further suggested to prioritise inspections using a differentiated approach by adapting regulatory instruments and inspection strategies to the specific situation of the company acting either: to agree on action plan and promote EMS towards environmental proactive companies; seek negotiated agreements (backed by potential more concrete measures) on needed changes and potentially promote EMS for ordinary firms; and adopting a firm authority role in the case of companies reluctant to take action themselves. Nielsen et al. (1994) have conceptualised such differentiation as acting either as: policeman towards the reluctant companies, as salesman towards the ordinary firms and dialogue partner for the proactive companies (Environmental Protection Agency, 1995; Moe, 2000; Nielsen et al., 1994).

Since the millennium, some adjustments of the overall regulatory framework have been implemented. As a response to pressure from the Danish Federation of Industries, a committee was appointed to streamline the regulation (Ministry of Environment, 2002, 2003). Based on its recommendations, two central changes have subsequently been implemented:

1. The permitting scheme was adjusted in 2005 by the establishment of "a simplified permitting scheme" for the majority of companies previously subject to permits. The companies under the simplified scheme do, in contrast to companies requiring a full permit, no longer have to justify that they have implemented BAT or cleaner technologies. Several of the applicable conditions defining BAT levels are for these companies formulated as general standard conditions that the competent authorities are obliged to use in the individual permits. None of these norms address the input side of resources, energy, waste prevention etc. (Christensen et al., 2006; Ministry of Environment, 2006, 2011).
2. The concept of differentiation in respect to inspection was altered along with a change to charge fees by the hour instead of a fixed amount. The differentiation was reframed from a concept centred on meeting different companies with different approaches, towards emphasising differentiating the frequency with which different types of companies should be visited – releasing those companies showing a good compliance history and having implemented an EMS according to either EMAS, ISO 14001 or equivalent (Christensen and Bauer, 2004; Ministry of Environment, 2007, 2011).

An update of the inspection guide (Christensen et al., 2006) still suggests that local authorities should apply both an "authority role" of stipulating, checking and enforcing norms, as well as a "catalyst role" of motivating companies to go beyond compliance. The guide does, however, emphasise that the cost of this catalyst role, contrary to the authority role, cannot be recovered from the businesses through fees (Christensen et al., 2006).

Lately, the regulatory frames have been altered again in response to the EU Industrial Emission Directive (IED). The main updates here relates to the inspection scheme. Denmark has now implemented a specific statutory order (Ministry of Environment, 2013) on the inspection and enforcement activities instead of relying on agreements and guidelines. This regulation obliges the competent authorities to both carry out inspections at a minimum frequency at each company, but also requires additional inspections based on a judgement of risk of non-compliance – adopting the frequency differentiation. The regulation further commands the local authorities to carry out "inspection campaigns" on specific themes e.g. waste, and/or certain groups of companies e.g. auto repair shops (Ministry of Environment, 2011, 2013).

4. Possibilities for addressing reductions of energy use and GHG emissions through direct regulation of companies

The previous section presented the overall Danish framework for the direct regulation of companies with emphasis on the inclusion of pollution prevention. This section present the triangulated analyses carried out in respect to the local officers possibilities and constraints for addressing energy use and GHG emissions within this regulatory framework. The analysis covers tree specific elements: interviews of local officers, documentary review, and an interview and correspondences with officers in Danish EPA.

4.1. The perceptions of the interviewed local officers

Interviews with the local officers taking part in the Carbon 20 project form the primary data source for this analysis. Focus in the interviews was, among other things, on how municipal officers perceive their options for addressing reductions of energy use and GHG emissions during direct regulation of companies. The interviewees were asked about their view of the legal basis for addressing energy and climate; their view of possibilities for promoting such as element in going beyond compliance; as well as their competences in respect to both addressing these issues and to act as facilitators rather than controllers. Furthermore, they were asked about what they see as possible challenges, limitations and constraints in respect to such aspects. The questions asked were a combination of more open ended, broad questions as well as more specific questions to get the officers to explain and elaborate on earlier answers.

The overall conclusion from these interviews were that addressing climate, energy, and for that matter use of resources, is perceived as something "nice to do" and far from a "must do" in respect to direct regulation of companies.

In general the interviews centred on two different, but interconnected elements:

- Addressing reduction of energy use and GHG emissions through juridical means e.g. as permit requirements and injunctions
- Facilitate and promote energy and GHG emission reductions (beyond compliance) during inspection

4.1.1. Addressing reduction of energy and GHG emission

The majority of the interviewed officers generally viewed – when answering an overall open ended question – that there is no legal basis for formulating requirement in respect to energy and GHG emissions as it is not listed in the specific clause in the subsidiary orders naming the parameters to include in permit.

Asked more specifically about the concept of BAT and the core principles in the preliminary paragraph of the Environmental Protection Act (see the argument of Basse later), the majority of the caseworkers did find that energy in principal is included in the BAT

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concept and that several of the EU BREF documents, to some extent, also addresses energy aspects. Equally it was also acknowledged that energy in principal could be interpreted as part of the general principals of resource optimisation addressed in the first paragraphs of the Environmental Protection Act. However several still emphasised that this is generally not sufficient for the local officers to act upon:

> "*BAT can in principle include energy aspects, but it is not something that is currently addressed. To stipulate requirements based on BAT requires a lot of detailed knowledge, so it will require that it be incorporated in the general instructions*" (Officer in Herning).

> "*There is indeed mentioned a lot in the preliminary principal paragraphs, but these are not detailed in the specific paragraphs. The ordinary environmental officers relate to these specific instructions – not abstract reflection from a lawyer*" (Officer in Allerød).

One of the officer in Kolding explained further that there are differences in respect to the EU terminology and the actual Danish framework whereas the legal basis is more diffuse in the Danish framework and thus not addressed for the majority of companies not covered by the EU regulation:

> "*Energy is included … at least the EU's understanding of BAT. However I do not think it is not fully implemented into the Danish regulations. If the municipalities shall address energy through firm juridically means, it must be written into the subsidiary act specifically – not only the general overall principles – it need to be stated in the specific § (…). But I do however believe that it is something that could come. In that case, it would require more detailed knowledge of specific technologies. A knowledge beyond the competences that seems possible to acquire in Carbon 20 project – here it is more about skills to encourage voluntary reductions.*"

As shown, she believe that there are some altering in the pipeline to include energy and climate more directly in the regulatory framework and thus for them to address. She do however emphasising that such strongly will require to focus on the competency among the local officers.

This is supplemented by one of the officers in Ballerup, who emphasised that the competences to address BAT do no longer exist in the municipalities, as there are few companies left that are subject to full permits and BAT.

> "*In principle energy could be addressed as part of BAT – e.g. ventilation. However the competences to assess BAT is limited in the municipalities. We have one officer from the former County who has experience with the use of BAT. But there are also only a few companies that need a permit where BAT can be addressed. The few subject to permits are further actually regulated by the decentralised state units. And Ballerup is even a municipality with rather many larger companies compared to many other municipalities*"

While energy etc. generally was not addressed at all in the requirements, some of the municipalities did address energy as a prerequisite for issuing permits. Both Copenhagen, but also Herning in respect to the agricultural field, requires an energy "screening" prior to granting permits. The intent is however (solely) to make the applicant aware of their use of energy, not to use it actively to pose requirements. As the officer from Herning agricultural unit expressed:

> "*So far it has (…) mostly been used as tool to "force" the farms to pay attention to their energy consumption, so that they can choose to do something – but it may eventually be developed in relation to also set requirements*".

4.1.2. Facilitate energy and GHG emission reductions during inspection

All the interviewees take part in the Carbon 20 project and thus have experiences with engaging companies to take action on a voluntary basis. All of the interviewed local officers also stressed that there are ample options within the regulatory framework to discuss energy optimisation and pollution prevention in prolongation of inspection activities. The officer in Albertslund highlighted:

> "*The Municipality has a long tradition of offering businesses support in their preventive environmental work in the form of courses, diploma schemes or projects. (…) Inspection is not solely about enforcement of environmental legislation. Part of inspection is used to have a dialogue and discussion with the company about the preventive environmental work e.g. savings in resource consumption, environmental management, environmental awareness and many other topics – in short, get the wider environment on the agenda of the company*".

Most of the interviewed officers also expect, that the experiences gained trough the carbon 20 project in can be activated in their dialogue with companies in the prolongation of inspection activities e.g. officers from respective Ballerup and Kolding:

> *"In general, the dialogue with the companies on Carbon 20 has been run separately from inspection. However in the future, energy can probably be addressed in prolongation of the dialogue on inspection – is of course a competence enhancing that contributes to a broadening of the range of the dialogue with the companies – expanded lenses for accessing the companies" (Ballerup) and "I expect that the knowledge accumulated in Carbon 20 can be activated to address energy during inspection in terms of making companies aware of the potentials of specific aspects. However only in the verbal communication and not included in the formal inspection reports"* (Kolding).

As the quote from Kolding indicates, some concerns were however raised about addressing energy etc. as part of the formal communications on inspection. During the focus group interview in Herning, such concerns resulted in some debate about how much guidance and suggestion on energy and other action beyond compliance one as an authority actually can advocate during inspection:

One of the officers, for example, stated: "*We as an authority have very little options for pointing at specific issues as it easily can be seen as requirements – as a must do and not can do*". Conversely, another pointed out: "*there are plenty of options to highlight opportunities for improvement when going around the company, without formulated it as requirements. I do however only provide such guidance during the spoken dialogue during the visit and not in the final written inspection report*". One of the other added: "*It is also possible to highlight energy loses without pointing at specific solutions, and refer to consultants for further advice*" (Discussing among officers in Herning).

The latter quote relates to a distinction between offering guidance – perceived to be within the officers jurisdiction – and offering cancelling – judge to be outside the officers jurisdiction due to liability issues.

In addition to such difference of opinions in respect to what can actually be suggested during the inspection, several of the

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caseworkers emphasised also that this open dialogue on voluntary effort requires a different approach and different skills compared to the traditional compliance monitoring and enforcement. As one officers in Copenhagen highlights:

> "*There are major differences in roles in relation to voluntary action and enforcement of requirements, and it is actually difficult to integrate the elements.* A colleagues supplements: *When you're not used to being in such a more open-ended dialogue with companies about voluntary efforts, you usually wants to have very precise guidelines for what we can offer before entering into the dialogue*".

The officer in Allerød supplemented this by saying:

> *I do think that I possess the skills for the facilitating role. One can always be better, but is generally fine. However some of my colleagues sometimes want to know everything before they talk to the companies (pause) but it will be necessary to accept that one can not know every thing, and that there's nothing wrong with returning after having assessed things further.*

The officer in Allerød further emphasised that this more open dialogue prerequisite that companies are somewhat positive towards the municipalities and show an interest in the environmental agenda. However most of the companies participating in a project like Carbon 20 belongs to this category. To address the laggards, one need to apply the more firm authority means:

> "*Generally, it is the environmentally "proactive" companies that choose to participate in such projects – they invest time in it despite the bottom line. (…) It is difficult to address the laggards – those a bit heavy in the ass – on such broader agenda. For them it is all about legal requirements*".

The above quotes all show that there are possibilities for addressing a broader environmental agenda during inspection as an element to motivate a voluntary effort to go beyond compliance. The majority of the officers did however also emphasise that this is to be considered as something additional and separate from their obligations in respect to inspections and thus difficult to address.

An officer in Copenhagen, for example, expressed that such often lack clear internal targets and measurement:

> "*It seems difficult to prioritize such voluntary aspect in relation to the other tasks that are often very clearly defined in relation to targets and deadlines: e.g. service goals in relation to response times, etc. Opposite, the promotion of the more voluntary actions does not have the same standard procedure for how to measure success. (…) Although that there is senior management attention to Carbon 20, there's not the same obligation in relation to service objectives etc.*"

The officer in Allerød and Næstved supplement that it indeed also relates to the local prioritisation of scares resources:

> "*It is basically a question of resources and the priority is still – presumably – to focus on what we must do" (Allerød) and "In the daily work, there are only resources for the most needed, meaning that required by law and not such facilitating beyond compliance*" (Næstved).

The interviewees all argued that they have experienced severe cuts in resources for permitting and inspecting during recent years. As the quotes from Allerød and Næstved indicate the interviewed officers did perceive that the inspection activities will be a lower priority to what is perceived to be strictly required, and also expressed some anxiety that they actually wouldn't be able to use the Carbon 20 experiences after the end of project.

During later conversations, the officers also expressed that the new inspection and enforcement legislation provide additional pressures, as they are perceived to require more bureaucratic and administrative work, while not being accompanied by extra resources. They did however also see some possible opportunities associated with the requirement to conduct inspection campaigns and thus an opportunity to address energy and climate change as part of these.

In contrast to the early interviews highlighting all the constraints, their optimism seemed to have change over the three years. They generally were confident that they would manage to continue in some way or another – the challenges were however still to navigate how given the restricted resources.

4.2. Result from documentary review of past judgements

Supplementing the interviews with the local officers, a documentary review of various past evaluations and recommendations of the permitting and inspection scheme has been conducted. Up through the 1990s and the start of the millennium, and again around 2010 the Danish EPA had initiated several different evaluations and specific assessment of the scheme that, in varying degrees, have touched upon the topic of this article. This section presents the analyses of these.

Following the twin focus of the interviews with the local officers, this review is equally presented in relation to:

- Addressing reduction of energy use and GHG emissions through juridical means e.g. as permit requirements and injunctions
- Facilitate and promote energy and GHG emission reductions (beyond compliance) during inspection

4.2.1. Addressing the reduction of energy use and GHG emission

In an early evaluation of the inclusion of cleaner technology in permitting and inspections, Kromann et al. (1996) concluded that the Environmental Protection Act (1991) and subsidiary orders provide a good framework for promoting and facilitating companies to adopt cleaner technologies as part of the permitting process. Companies have to report about the use of cleaner technology in their application, and the competent authority can refuse to provide an environmental permit. This forms a good platform for dialogue, but does not provide any clear legal base for addressing cleaner technologies in the permit conditions or injunctions (Kromann et al., 1996).

Contrary to this, Paludan (2005) argued – based on an unpublished earlier legal judgement by a professor in environmental law (Ellen Margrethe Basse) – that there is a legal basis and even obligation to address waste prevention and resources as part of BAT. The argument of Basse is that waste prevention and resources are addressed as element in BAT and in the principle paragraph of the Act. While the subsidiary permitting order do not explicitly mention resources and waste prevention as aspects to address in the permit, it does state that the conditions shall secure the continuing fulfilment of the prerequisite for issuing the permit covering specifically BAT. As BAT, resource and waste prevention furthermore are addressed in the principle paragraphs of the Act, this both reemphasises the legal basis in respect to permits, but also provides a legal basis to pose injunctions during inspections. It is

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however emphasised that this legal basis relies highly on the concept of BAT and further that only limited actual judicial practices exist and none have been questioned in the juridical system (Ministry of Environment, 2006; Paludan, 2005).

Engel et al. (2005) find that the argument of Basse (presented in Paludan, 2005) is also valid in respect to energy savings. They argued that energy use is to be considered as a resource and thus part of BAT (Engel et al., 2005).

Professor Basse, who made the argument in the first place in respect to waste prevention, has however some reservations towards Engel et al. (2005) application of the judgement in respect to energy. She agrees that energy is to be considered part of the EU regulation and thus BAT. However, she points out that the Danish regulation is a blurred mixture of several different juridical principles. There might thus apply some old "administrative" principles related to the specialisation of formal competences between different public entities that might counteract this legal basis in relation to energy as such is the domain of the Danish Energy Agency (Basse, 2011; Erhvervspanelet for Grøn Omstilling, 2012; Ozimek, 2013).

As mentioned, the regulations were altered in 2005 by introducing the simplified permitting scheme. Basse's judgement was conducted before these changes. The inspection guide from 2006 (Christensen et al., 2006), published just after these changes, emphasises that the local officers options to address issues related to cleaner technology have been significantly reduced at those companies subject to the simplified system – even lower than companies subject for injunctions. The reason for that is precisely a consequence of the alterations made concerning BAT.

Lately the Danish EPA has carried out a preliminary assessment of the current experiences of addressing energy as part of direct regulation (Viegand Maagøe, 2013). This report find that some of the decentralised units of the state administration jurisdiction of regulating the bigger companies subject to full permits have some limited experience in undertaking an energy screening before issuing a full permit and even also stipulating requirements – e.g. a periodic screening. Opposite, only very few experience exists among the local authorities. These are furthermore primarily related to addressing energy and climate in voluntary projects like Carbon 20 and/or distribution of information during inspections (Viegand Maagøe, 2013).

4.2.2. Facilitate energy and GHG emission reductions during inspection

As mentioned the establishment of the simplified permitting scheme was not the only element in a bigger change of the regulatory framework during early 2000s. The inspection framework was also altered in respect to the concept of differentiation. In the 1995 guidelines, the concept centred on meeting different companies with different approaches (situation dependent). In the 2004 guide the focus is on the frequencies of visit.

To emphasise such streamlining, The Danish Federation of Industries (DI) published a small political leaflet promoting the concept of "selvforvaltning" (self-regulation) for those companies having a certified EMS (e.g. ISO 14001 or EMAS) (Dansk Industri & CO-Industri, 2003).

In preparation for expected necessary changes in response to the new IED directive, the Danish EPA appointed a new committee (Virksomhedsudvalg II) to provide input into this process (Ministry of Environment, 2011). As a component to their work, two evaluations of the changes made after the first committee (Virksomhedsudvalg I) were conducted and published in 2010: One on the view of the environmental officers (Ellegaard et al., 2010); and one on the companies' perspective (Sønderhousen et al., 2010).

In contrast to the points presented by DI, the evaluations on the companies view showed that most companies with EMS in place etc. actually appreciate a frequent contact with the environmental authorities – emphasising however the value of a dialogue rather than rigid control (Sønderhousen et al., 2010). Similar conclusions have been made already in the early evaluation of Kromann et al. (1996).

The evaluation of the officers' view, Ellegaard et al. (2010), similarly concludes that environmental officers do not experience such demand for regulatory relief of those companies having an EMS – sometimes even quite opposite. They argued further that the presence of an EMS in a company does not alone secure neither compliance nor superior performance. Ellegaard et al. (2010) thereby supplement the earlier evaluation of Kromann et al. (1996), who referred officers for arguing for an active role as important critical reviewer and dialogue partner to keep the companies – even those with EMS – committed to making improvements (Ellegaard et al., 2010; Kromann et al., 1996).

Ellegaard et al. (2010), furthermore, conclude that the administrative resources used for permitting and inspection activities in municipalities have been reduced significantly over recent years. In 2002 there were 646 fulltime employed, and in 2009 this was reduced to 437 employees in spite of an increased in the number of companies under the municipalities jurisdictions. Consequently, several municipalities have difficulties in just meeting the agreed minimum frequencies, and thus are not applying any form of differentiated inspection – neither in respect to approach nor frequencies. Furthermore the focus is restricted to mainly inspecting compliance and not necessarily focussing on the largest environmental improvement options (Ellegaard et al., 2010).

In spite of these more recent evaluations, the second committee still proposed to maintain this frequency differentiation, albeit integrated with the minimum frequency concept. The committee did however still emphasised that the authorities should attempt to address companies through more proactive oriented dialogue before more firm means and suggested add in the use of inspection campaign (Ministry of Environment, 2011).

4.3. Results from interview and correspondence with Danish EPA

To supplement the view of the interviewed local officer and the documentary review of past contributions an interview and subsequent correspondences were conducted with officers in the Danish EPA.

Contrary to the two other analyses above, the interview with the officer in Danish EPA mainly addressed the legal issues. Subsequent correspondence took an outset in the inspection campaign, but in the argumentation also mainly addressed the discussions on legal basis. This presentation is contrary to the two above thus not subdivided.

In the interview, the officer highlighted that energy is part of BAT in EU definitions and therefore also in the Danish implementation. He therefore conceives that there is a legal basis for addressing energy in permits conditions – at least for companies subject to full permits.

He confirmed that energy so far hasn't been a priority:

> "*In spite of energy being part of BAT – also in the IPPC and not first from IED – there hasn't been a tradition of including energy in permits. Some have requested information prior to the application, but rarely used it to stipulate requirements*"

He did acknowledge that the legal basis is not that clear and lack guidelines in terms of what should be addressed and how. However, he finds that several similar aspects are addressed even though they also lack clear legal basis nor have any formal

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guidelines. To provide explanation for such, he pointed to the former existence of the voluntary energy agreements scheme, where most of the bigger companies had entered specific agreements with the Danish Energy Agency (ENS):

> "*Part of the reason for lack of focus is, however, that several of the large enterprises subject to permits previously had agreements with the Energy Agency regarding implementation of energy management system and realisation of energy saving projects with pay pack periods below one year and therefore conceived adequately covered trough those*".

The increased focus on Energy in the IED directive and the altering of the ENS agreement scheme has made Danish EPA begin to have some preliminary thoughts to address energy more explicitly through the environmental regulation scheme. He point out that Danish EPA as a first step has asked a consultancy to assess current experiences in the field (the previous mentioned Viegand Maagøe, 2013 – published after the interview).

In the subsequent correspondence on the possibilities for using the new requirement to conduct inspection campaigns to address energy and GHG reductions, the Danish EPA first argued that this is not possible, as energy are not perceived to be covered in the environmental protection law. Shortly after, they altered this to the opposite – that it is possible to address energy in the inspection campaigns. They did however also emphasise that inspection campaign activities targeting energy cannot be charged fees unless energy aspect is specifically addressed in any applicable (permit) requirements.

In their reasoning for the latter decision they made a legal judgement that there is a legal basis for formulating requirements in (full) permits related to, for example, the periodic auditing of energy performance. They even point out that energy uses are to be considered as a significant source of pollution and thus a priority to address through the environmental regulation.

5. Assessment of the regulatory framework in light of the results of the 3 analyses

The overall Danish regulatory framework was presented in Section 3 specifically with emphasis on pollution prevention. The previous section presented the results of three specific analyses of the regulatory framework on the local officers' options and constrains for addressing pollution prevention: interviews with local officers; documentary review; and interview and correspondence Danish EPA. These three analyses are combined into one assessment in this section.

The interviews with the officers in the municipalities centred on two different but related elements that both structured the analysis of these interviews and the review of the past evaluations. This section is also structured in respect to these two somewhat distinct elements:

- Addressing the reduction of energy use and GHG emissions through juridical means
- Facilitating energy and GHG emission reductions during inspection

5.1. Addressing the reduction of energy use and GHG emissions

As shown, the Danish overall regulatory framework has addressed pollution prevention, cleaner technology and resource efficiency etc. since 1991. In spite of this, the interviewed local environmental officers all conceive that the regulatory framework fails to provide clear guidelines for them to address such issues directly in their interactions with companies.

The documentary review confirms that the basis is not that clear, as the principles are not addressed more consequently in the subsidiary act and guidance materials.

The question of the legal basis for addressing energy, resource and waste prevention etc. has thus been the subject of debate and different opinions. Recently, the Danish EPA has provided more clarity, however only covering the limited situation of full permits. They judge that the environmental law covers energy and that there is a legal basis for addressing and setting requirements during permitting – following the argument of Basse. The Danish EPA further pointed out that it should be considered a significant environmental issue. Based on a recent overview assessment (Viegand Maagøe, 2013), the Danish EPA underscores that it is already practised by some few officers in the decentralised environmental state units in respect to full permits, however only limited among the municipalities.

The majority of the interviewed local officers also acknowledged that energy in principle could be interpreted as related to both the principle paragraph of the Environmental Protection Act as well as included in BAT. However, far from all interpreted this to be an adequate legal basis. All of them still emphasised the need for clearer directions in the subsidiary orders and guidelines. Equally to Basses argument, those that acknowledge a legal basis perceive it to be closely related to BAT. They interpret that BAT is only relevant for the few companies subject to full permits, which is mainly regulated by the decentralised state units – not the municipalities.

The municipal officers emphasise that the competences to discuss BAT with companies have decreased during past decade as a direct effect of the altering the regulatory framework with only few companies regulated by municipalities subject to a full permit. A new focus on including energy and climate aspect more consequently will thus call for further training and education at the local level.

As mentioned, the regulation was altered significantly just after the millennium. The majority of the companies – especially those under the municipalities' jurisdiction – are now covered by the simplified scheme or solely by inspection and injunctions. The simplified scheme specifically altered some of the requirement related to BAT. The 2006 inspection guideline also pointed out that the options of local officers to address cleaner technology have been significantly reduced. It even states that options are even lower for related to companies subject for simplified permits than for companies subject solely to injunctions during inspections. The paragraph central for the injunction were precisely not altered. Following Basses' argument in relation to waste prevention and injunctions, there may thus be basis for actually stipulating injunctions related to energy and climate for such companies as well. There might however still apply some old special Danish rules that otherwise are overruled by the EU IED directive for the companies covered by full permits. Unfortunately, the clarification from the Danish EPA addresses neither the simplified permit scheme, nor injunctions for those not covered by neither.

The Danish EPAs change of judgement and the ordering of the Viegand Maagøe (2013) report do however mark the Danish EPA's preliminary attempt to respond to growing interest among the municipalities – and not solely the carbon 20 municipalities – to address energy and GHG reductions of the local companies.

5.2. Facilitating reduction of energy and GHG emissions during inspection

In contrast to the legal basis and options for addressing energy as by more firm authority means, all the interviewed local

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environmental officers stressed that they have room within the regulatory framework to discuss energy optimisation and pollution prevention during inspection – however as an element in promoting action beyond compliance as something additional and more or less distinct different from their normal day-to-day inspections – mirroring the 2006 inspection guidelines clear distinction between an "authority role" and "catalytic role".

While the 2006 guide points out that the catalyst role is not charged, it does not address whether this role is to be considered as "additional". As argued above in respect to the legal basis, the borders are not that clear. If energy etc. is to be considered part of the regulation and it has been addressed previously e.g. in permit, the inspection activities around it could properly be charged, whereas if not addressed in permits etc. it cannot be charged.

The Danish EPA underscoring that energy can be addressed in inspection campaigns as well as the second committee's emphasis on dialogue before more firm means (Ministry of Environment, 2011) indicate that such more facilitative aspect is to be considered as part of normal obligations even though it cannot be charged.

Opposite, perceiving the role as additional – as the majority of the local officers – makes such role dependent on local prioritisation and often than considered something that can be cut away when resources are scarce. As mentioned, a recent evaluation (Ellegaard et al., 2010) confirmed the interviewed local officers impression that the administrative resources used for permitting and inspection activities in municipalities have been reduced significantly – from 646 fulltime employed in 2002 to 437 employees in 2009 (Ellegaard et al., 2010).

The interviews with the local officers revealed that the combination of increased focus on laggards and scarcity of resources has contributed to a focus on enforcing compliance related to local pollutants rather than proactive dialogue on actions on pollution prevention and the more global environmental issues. This has even contributed to a loss of competences to discuss BAT and to enter into more open-ended dialogues among the local officers.

The local officers see challenges with the new inspection regulations – e.g. increased bureaucratic administration, but do also see opportunities especially related to the inspection campaign and the latest responses from Danish EPA on that matter.

Based on the experiences gained through the Carbon 20 project and in response to latest response from Danish EPA, a change of attitude towards the possibilities for continuing the focus after Carbon 20 have been noticed. Contrary to some views expressed during the interviews after the first year, most officers were by the end of the project determined to find ways to continue – altering the perception of the highlighted constraints to be viewed as challenges that need to be overcome.

6. Conclusion

The outset for this article was a realisation that most officers participating in the Carbon 20 project were actually more or less in a process of abandoning – if ever applied – the ideas advocated during the last decades about addressing pollution prevention, cleaner production and resource use, as well as promoting and catalysing environmental improvements beyond compliance. Only their active involvement in Carbon 20 seemed to secure that this agenda gained renewed focus in respect to energy savings and climate change.

This contradict the typical representation of the environmental regulation as evolving progressively from the command-and-control focus on local pollutants towards a pollution prevention strategy addressing global environmental concerns and lifecycle perspective and called for a closer analyse.

Mirroring the international debate and prior to the IPPC directive, the Danish regulatory framework was already in 1991 altered to include cleaner production, BAT, waste prevention and resource efficiency as core principles – more than 20 years ago. Likewise several attempts and experiments have taken place in Denmark during especially the 1990s focussed to expand the role of local authorities from just inspectors of compliance towards facilitators of continuous improvements.

In spite of this, an implementation gap is identified to exists in respect to the actual practices of the local officers executing the regulations – and this is even in a country previously viewed to be among the frontrunners and among municipalities engaged in a collaboration called 'Green Cities'.

The reason for this implementation gap was assessed and it was found that the constraints fall in respect to two different but related elements of the regulatory framework:

1) Addressing the reductions of energy use and GHG emissions in permits and injunctions
2) Facilitating and promoting energy and GHG emission reductions during inspection

In relation to the first issue of legal basis for stipulating requirement, the conclusions are:

- the regulatory framework is blurred and fails to provide proper direction for the local officers' execution in respect to pollution prevention, energy, etc.;
- the reforms made in 2005 seems to have reduced the local jurisdiction and competences to address BAT, energy, waste prevention, etc.;
- Danish EPA is beginning to address the topic emphasising that energy is to be considered a significant focus and clarifying that there is legal basis – at least in respect to full permits.

In relation to the second issue related to inspection, it is found that:

- there is indeed ample room for addressing energy as part of a catalytic role of promoting companies to make a voluntary effort going beyond compliance;
- this role is perceived as additional to the required authority role and dependent on local priority of scarce resources;
- reductions in finances and resources of municipalities has put pressure on the direct regulation activities and especially the aspects considered additional;
- changes in the term "differentiation" has contributed to a downgrading of the more open dialogue with the frontrunners and further a lost of competences for the dialogue based catalytic approach;
- several municipalities seem to continue to prioritise local voluntary efforts anyhow, especially seeing possibilities in the newly adopted inspection order introducing inspection campaigns.

Based on these finding it is concluded that the framework apparently does allow for (or as least not exclude) that the local environmental regulators address energy, GHG, resources and pollution prevention as well as promoting companies to take action beyond minimum compliance with the regulations. However, in practice the direct regulation of companies is still dominated by a traditional authority role focused on conventional environmental parameters.

However, a continued focus on climate change, reductions of energy and resource use, as well as green growth may trigger a

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renewed focus on the need for addressing broader environmental concerns as well as reintroducing the facilitative and catalytic role. Several municipalities are carrying out EU financed projects on this and are lobbying for continuation after these projects. Danish EPA has commenced some clarification processes on the overall framework in terms of the options and responsibilities to address energy and GHG emissions etc. while however still lacking directions in terms of all the different categories of full permits, simplified permits, injunctions during inspection etc.

The finances of municipalities are still under pressure and puts severe constraints on such initiatives, including the continuation of Carbon 20. However, the local officers now – contrary to in the beginning of the project – seem to be confident that they will continue. While they previously defensively identified all the constraints and barriers for continuing the efforts, they now constructively perceive these constraints as challenges that can – and shall – be overcome.

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CHAPTER 7. THE ARENA OF ENERGY EFFICIENCY

This chapter is the second of the three chapters on the vertical interlinkages of the governmental system each addressing the municipalities' regimes of practises and dominating discourses within a specific Governmental Arena – here the cooperation among the municipalities and energy consultants in light of the existence of a national Danish energy efficiency obligation scheme (EEO).

This chapter is also a "stand-alone-paper". The paper is a conference article published in the peer reviewed proceeding from the ECEEE industrial summer study 2012 and here reprinted from http://proceedings.eceee.org/visabstrakt.php?event=2&doc=1-006-12.

As already explained, the specific wording introduced in the conceptual framework is not fully applied in this paper. The focus of the analyse is, however, the discourses dominating the discussions on EEO and white certificate schemes, the regulatory frames and institutional settings in relation to the specifics of the Danish EEO scheme, as well as the municipal practise and specific governing technique of linking up to the EEO scheme by cooperating with the energy consultants to offer the companies screenings free of charge.

Some of the insight of the article has in earlier versions been discussed in the first monitoring report of the Carbon 20 project, AAU (2012).

In response to the findings of the paper, additional elements central for this topic have been addressed during the carbon 20 project. This relates e.g. to a specific evaluation workshop together with the used energy consultants; some lobbying for altering the EEO by the interest group and member authority of Danish municipalities, Danish Local Government Denmark (LGDK); as well as different projects succeeding Carbon 20 trying out some different constellations to address the smallest companies. These are not address here in this chapter as taking place after finalising the paper. They will in stead be mentioned both in chapter 10 and chapter 11.

7.1. PAPER 3: CAN ENERGY UTILITIES PLAY A ROLE IN LOCAL POLITICAL ENERGY SAVINGS PROGRAMS?

Can energy utilities play a role in local political energy savings programs?

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Keywords

governance, local or regional energy efficiency measures, voluntary agreements, energy-saving programme, climate action plan, greenhouse gas emission reduction

Abstract

Danish municipalities are putting climate change high on the agenda with action plans and targets to cut greenhouse gas (GHG) emissions. To reach these targets the municipalities need to engage citizens and the local business sector. In order to find new routes on how to engage and motivate local businesses to achieve GHG reductions, seven Danish municipalities (Copenhagen, Albertslund, Allerød, Ballerup, Herning, Kolding and Næstved) have joined forces in an EU LIFE project "Carbon 20". A key element in the Carbon 20 project is to offer an energy screening free of charge for the participating companies. The Carbon 20 project has entered agreements with different energy consultants to provide these screenings for little or no cost – utilising a national scheme obligating the Danish energy utilities to reduce energy use among customers. However, the energy consultants are rather reluctant to offer the screening to small companies since the savings are rather limited in absolute terms. This article will focus on the appropriateness of using energy utilities (or consultants working on their behalf) in a local political context of engaging the local business sector in achieving energy savings and GHG emission reductions. It concludes that all the actors seem interested in continuing expanding the cooperation, however all also stresses that the current set-up needs to be improved to secure a clear win-win-win situation for all parties.

Introduction

The intergovernmental Panel on Climate Change stated in their 2007 report that global warming is taking place, and that it very likely is caused by human activities resulting in the release of greenhouse gases (GHG) such as CO_2 (IPCC 2007). They further pointed to the reduction of energy consumption as one of the most effective ways to cut GHG, and further pointed at the industrial sector for having a big potential for improving their energy efficiency (IPCC 2007).

Several scholars have however concluded that a "gap" often exist between potential cost-effective energy efficiency measures and measures actually implemented in companies – also known as the energy efficiency gap or energy paradox (Thollander, Danestig & Rohdin 2007, Thollander, Dotzauer 2010, Rohdin, Thollander 2006, Paton 2001, Jaffe, Stavins 1994).

Such gaps relate to several different barriers, which for SME's among others relates to (Thollander, Danestig & Rohdin 2007, Lees 2012):

- Lack of time or other priorities (including for capital investment).
- Lack of access to capital/funding.
- Cost of production disruption.
- Lack of knowledge.
- Energy efficiency measures is, in contrast to renewable energy measures often unseen and rarely a conversation point for business and often not subsidised by governmental funding in same extend as renewables.
- Energy efficiency calls for a variety of different skills often not present in SME.

- Energy cost (although risen in recent years) is not a significant element of SME's expenditure.

The existences of these gaps and barriers makes Paton 2001 argue that regulation and policy driven voluntary agreements does play an important role for directing attention to these savings potential (Paton 2001). This especially applies for SME (Lees 2012).

Several countries have also applied political programmes targeted energy-efficiency improvement in industries often in the form of voluntary agreements either with single firms or branch organisations etc. (Krarup, Ramesohl 2002, Krarup, Ramesohl 1999).

However according to respectively Bradford (2008) and Thollander (2010) the majority of these programmes have targeted the big energy consumers such as large companies and industrial sites, while SME generally have been overlooked. However there often exist untapped potentials (Thollander, Dotzauer 2010, Bradford, Fraser 2008).

In Denmark energy-efficiency policies targeting both households and businesses have been in place since the seventies and reinforced during the nineties. The main approach for promoting energy efficiency in businesses has been the introduction of energy taxes, but providing the energy intensive companies an option to get rebates if they enter a voluntary agreement with Danish Energy Agency to cut energy use (Krarup, Ramesohl 2002, Krarup, Ramesohl 1999, Togeby et al. 2009, Ericsson 2006).

In recent years, the energy saving policy in Denmark has been added a policy mechanism that mandates the energy distributors to save energy among their customers (Togeby et al. 2009, Togeby et al 2012). While the distributers previously have been subject for internal efficiency targets, and requirement to provide information for customers about their general use, from 2006 they have to show specific involvement in reducing end-use energy consumption.

Denmark is thus following similar trends as in several other countries also applying obligations for energy utilities to save end-use energy as an important policy tool for achieving increased energy efficiency. Several different scholars/authors have addressed this policy tool from several perspectives dealing with both specific evaluations and more theoretical economic discussions (see among others Giraudet, Quirion 2008, Friedman, Bird & Barbose 2009, Moser 2011, Rezessy, Bertoldi, Giraudet, Bodineau & Finon 2011, Bertoldi et al. 2010, Child et al. 2008).

A preliminary assessment of the Danish implementation done by Togeby et al. in 2008, found that this approach seems to provide cost-efficient energy savings (Togeby et al. 2009), however a newly published evaluation also by Togeby et al. concludes that the approach has socioeconomic benefits when it comes to savings within the business sector, but fails to deliver socioeconomic benefits in relation to private housing (Togeby et. al. 2012). It further emphasises that the actual net savings is below 50 % of the reported savings in the business sector and even below 20 % of reported savings in private housing. By net savings they refers to the actual achieved savings that can be ascribed this policy tool taking into account both additionality and inaccuracy in the reported savings. In other words only respective half and 1/5 of the reported savings under this schemes can be ascribed to actual implemented savings because of the scheme (Togeby et. al. 2012).

In addition to the national political initiatives, the local political level is increasingly also addressing energy savings among its citizens and especially the local business sector with special emphasis on SME.

Also here there are plenty international experiences. Evaluations of some of these initiatives in the UK and Sweden by respectively Bradford and Fraser 2008 and Thollander and Dotzauer 2010 among others conclude that such schemes should provide a energy screening/audit free of charge or at least highly subsidized and engage in follow up facilitation to help implementation (Bradford, Fraser 2008, Thollander, Dotzauer 2010).

In Denmark, several different initiatives also exist. Among others have seven municipalities joint forces and formed the Carbon 20 project aiming at engaging 100 local companies, primarily SME, in reducing their GHG emissions by 20 % through e.g. energy savings.

The concept in the Carbon 20 project is to utilize the energy saving obligations of the energy utilities to get them to offer energy screenings/audits free of charge to business within these seven municipalities provided that the businesses enters a Voluntary Agreement with the municipality to cut their GHG emissions by 20 %.

This paper adds to research on energy saving obligations and municipal energy efficiency schemes by assessing specifically how such an energy obligation scheme can be activated in a municipal setting through engaging the local business sector.

The article is based on interviews with civil servants in the participating municipalities of the Carbon 20 project, some of the involved energy consultants and experts in the field as well as reviews of different evaluations and political documents.

Energy saving obligations for energy utilities

Several countries have established obligations for their energy utilities to save end-use energy as a central element in achieving national energy savings. In EU among others: UK, France, Italy and Belgium/Flanders (Lees 2012).

According to a resent study by ECEEE these energy saving obligation schemes (or EEO – Energy Efficiency Obligations – as Lees frame them) often consist of (Lees 2012, Bertoldi et al. 2010):

- Part of the energy utilities have an obligation to save energy in eligible end-use customer segments.
- This obligation can be allocated to either distributers or retailers. When allocated to retailers the cost of the saving is generally included as a normal part of general market price for energy, whereas the cost often is stated as a fix element of the energy bill when targets are allocated to distributers.
- If the Energy utility fails to deliver those energy savings, the company will incur financial penalties.
- Generally the energy utilities are not restricted to savings from own customers and the companies can shell and by earth others savings.

- The target for the particular energy company is related to its market share in the volume of energy supplied or distributed by it.

The study by ECEEE makes the overall conclusion that "*there is clear evidence that well designed EEOs (…) can overcome many of the barriers to energy efficiency which prevent the uptake (…) especially by households and small organisations*" (Lees 2012).

The argument is mainly that the schemes provide the energy utilities incentives to offers the end-users personalised advice about their energy use and thereby are capable of overcome some of the mentioned barriers. However, the report do also point out, that cost of measuring compared to savings achieved is better in bigger projects, where the actual measuring of savings from households would be relative expensive as little savings is achieve in each project. For this reason several schemes have introduced some "simple approach" calculations based on average figures in relation to households, while specific calculations based on specific applied solutions is generally used in the business sector (Lees 2012).

THE ENERGY SAVING OBLIGATION OF ENERGY UTILITIES IN DENMARK

As mentioned in the introduction, Denmark has been addressing energy efficiency since the mid seventies and reinforced during the nineties resulting in among others high energy prises due to energy- and CO_2 taxes and targeted contributions over tariff (Togeby et al. 2009, Togeby et al. 2008).

Part of the revenues from these "taxes" are reinvested in targeted initiatives to reduce the energy use in Denmark covering such activities as support for the different information campaigns, support for different knowledge and counselling centres as well as covering the cost of the energy saving obligations for energy utilities (Togeby et al. 2009, Togeby et al. 2008).

The energy utilities in Denmark have been obliged to realise energy savings since the 1990s covering own activities and information to own customers. However from 2006 they are now obliged to achieve savings in end-user segments (households as well as businesses and public sector but not restricted to their own customers) (Togeby et al. 2009, Togeby et. Al. 2012).

In contrast to e.g. UK and France, where the obligations are directly given the different energy retailers (suppliers/vendors), the obligation in the Danish scheme rest upon the distributers (grid companies) of respectively electricity, gas and heat. Furthermore, the actual targets are formulated in "voluntary agreements" between the Energy Agency and the different central business associations, who then distribute the commitments (Lees 2012, Bertoldi et al. 2010, Togeby et all 2009, Togeby et all 2012). As with the other schemes, there is a possibility for issuing penalties if targets are not achieved, however, at present, they are not defined (Moser 2011). Instead of penalties, the Danish schemes rest upon compensating the companies for their expenses from a part of the reinvested revenues from energy taxes mentioned above (Togeby et al. 2008).

In the latest political agreement on energy in Denmark, the savings that the energy utilities need to achieve has been increased significantly, while also reserving a larger proportion of the reinvested revenues to cover the energy utilities' expenses including any subsidy for the end-users (Regeringen 2012).

At the same time, the new political agreement cut funding for the general knowledge distributing institution (Go' Energi), that have been focusing on providing targeted information for especially SMEs, households and public institutions and internalising some of their general information aspect under Danish Energy Agency. (Regeringen 2012, Togeby et. al. 2012).

The energy utilities must demonstrate that they, or the consultants working on their behalf, have been actively involved in a project in order to count the savings achieved as part of their obligations and get compensated their expenses. This involvement can consist of either (or a combination thereof): energy audits/screenings, targeted information, counselling or/and subsidies. However, there is (at the moment) no requirement that the identified savings need to be additional, meaning that there is no requirement to show that their involvement has been decisive for the realisation of the saving. The utilities documentations of their involvement and reported savings is not subject to any third party verification, but shall be kept for 5 years and subject for conformity samplings (Togeby et al. 2008, Togeby et al. 2012).

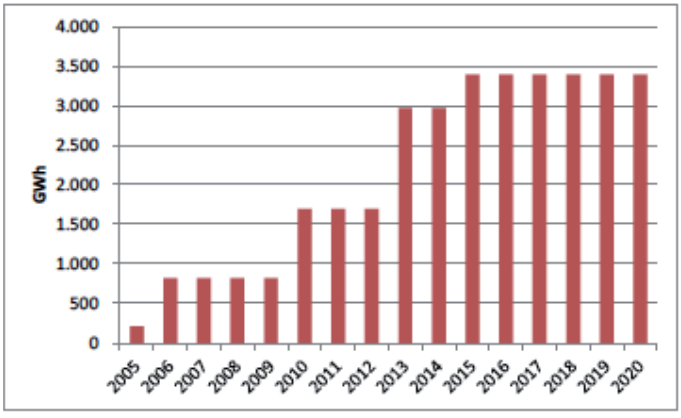

Figure 1. The obligations for the Energy Utilities savings in Denmark (Togeby et al. 2012).

A recent evaluation of this energy saving obligation scheme (Togeby et al. 2012) concludes that for the business sector only below 50 % of the achieved savings are considered as additional due to this policy tool, whereas it is even below 10 % for the private housing. It furthermore concludes and confirms earlier samplings of the scheme (Niras, ViegandMaagøe 2011) that several of the reported savings is overestimated. This means that the net-savings are below 50 % and 20 % of the reported savings for respectively companies and households. As mentioned in the introduction, net savings is here an estimation of the actual savings implemented due to this policy tools when adjusting the reported savings in respect to inacuraties and additionality. Furthermore, both evaluations state that several procedural faults, inadequate- or incomplete data also has been found (Togeby et al. 2012, Niras, Viegaard Maagøe 2011).

Despite this, the evaluation concludes that energy saving obligations on energy utilities contribute with socioeconomic efficient savings in relation to the business sector, but fail to do so in the residential sector (Togeby et al. 2012).

The evaluation also provides some recommendations – relevant for the business sector among other: that companies should not receive subsidy for projects with payback time below 1 year, and that the subsidy should account for a maximum of 30 % of the investment (Togeby et al. 2012).

Local political level focus on Climate Mitigation

Around the world several local authorities are putting climate on the agenda. For instance, the international initiatives "ICLEI - Local Governments for Sustainability" (formerly 'International Council for Local Environmental Initiatives) and the C40 Cities Climate Leadership Group addressing climate mitigation. Likewise in EU, several municipalities are joining the Covenant of Mayors, among them 25 in Denmark, committing themselves to reach the EU 20 % reductions of GHG in 2020 within their local area[1].

The municipalities often only directly control a minor part of the emissions themselves, whereas the local business sector often control around one third, while private housing is responsible for a majority of the emissions The municipalities will thus need to engage the local citizens and the local business sector in order to be able to reach their GHG reduction targets. While several municipalities are taking actions also in the private housing sector, this article focuses on efforts regarding the local business sector (Albertslund Kommune 2009, Ballerup Kommune 2010).

As mentioned in the introduction several different schemes for engaging the local business sector and SME have been conducted and evaluated. Some of the main conclusion in terms of reaching SME is: That specific consulting about potential savings are provided free-of charge or higly subsidized, and that there will be offered some followup guidice in thems of implementation of highlighted savings (Thollander, Dotzauer 2010, Bradford, Fraser 2008).

1.http://www.borgmesterpagten.eu/about/signatories_da.html?q=S%C3%B8g+efter+en+underskriver%E2%80%A6&country_search=dk&population=&date_of_adhesion=&status= (the 20th june 2012)

THE CARBON 20 PROJECT AND ENERGY EFFICIENCY OF BUSINESS

In Denmark, several municipalities have taken different initiatives to engage the local business sector in reducing their GHG emissions and energy efficiency and energy savings is often the starting point for this engagement.

Among them, the seven Danish municipalities (Copenhagen, Albertslund, Allerød, Ballerup, Herning, Kolding and Næstved) have joint forces in a EU LIFE project "Carbon 20" with the purpose of engaging 100 local businesses in in achieving a 20 % reduction of their GHG emissions. The project aims to reach its targets through entering specific voluntary agreements with each where the company on the one hand "commit" to reduce emission by 20 %, and at the same time is provided some consulting from mainly energy consultants free of charge for the companies[2].

To perform these energy screenings the project have entered agreement with several different energy consultancies. This include both internal consultancies under the energy utilities subject for the national savings obligations, but also other consultancies that uses the energy screening as platform to promote and sell hardware solutions. The general agreed concept is that the consultants provide the screening free-of-charge for companies. However, the consultants can be compensated by the project with approximately 700 Euro given that e.g. the company doesn't chose to report the saving through the given consultant/Energy utility.

Experiences with the combination of obligation to energy utilities for energy savings and municipal schemes for engaging the local business sector

In the Carbon 20 project, the 7 municipalities have made general agreements with 8 energy consultants. At this point in the project there is mainly experiences from involving half of them covering both the energy utilities (electricity) (SEAS-NVE and TRE-FOR), district heat producers/distributers (Vestforbrændingen and Albertslund forsyning) as well as a consultancy also selling hardware solutions to achieve savings (Schneider Electric). This subsection is based on interviews with energy consultants working at 4 of these (SEAS-NVE, TRE-FOR, Vestforbrændingen and Schneider), as well as interviews with civil servants at the 7 municipalities.

The majority of the interviewed energy consultants do to varying degree pay some attention to the national energy savings obligation scheme mentioned above, however, for several of them, the obligations seems only to play a minor role for their participation in Carbon 20.

ENERGY UTILITIES (ELECTRICITY) EXPERIENCES FROM THE CARBON 20

Several of the electricity utilities have established specific units focused on providing consultancy as an effort to achieve energy savings that can count as part of their savings obligations.

In the beginning of the scheme, they generally offered the energy audit free of charge, but with a restraint that any subsidy (applicable due to the energy saving obligations scheme) for the identified savings would be kept by the energy utilities. However, as the scheme developed, a market for energy savings have

2. www.carbon20.dk (the 20th june 2012)

developed, where companies can sell their savings not only to energy utilities, but also different installers, electricians and other intermediates etc. The offering of these free audits with restraints attached has therefore become counterproductive as they became subject for disputes about the "ownership" of the saving.

Today, the majority of the energy utilities do not perform their own consulting services any longer, but are instead relying on fulfilling their obligations through "buying" savings from installers, insulators, electricians etc. Those who still have kept their internal energy consultancy unit also only achieve a minor part of their obligations through this direct consulting. Togeby et al. 2012, as well as Lees 2012, confirms this trend of relying on 3rd parties.

Furthermore, they have changed the approach. Instead of providing the audit free of charge, such audits now cost from around 1,000-2,500 Euro, but with no restrictions in terms of possibilities for "selling" the identified savings subsequently. The upfront payment is however only to cover the cost of performing the audit, and not as such something that the energy utilities earn money on. The focus of the audits and reports are still to be used as a platform for identifying savings. The energy utilities then enter specific agreements about the implementation of the identified saving, including subsidising them given that they can attribute the saving to their savings obligation.

In contrast to the earlier approach of providing the audits free of charge, both interviewed electricity utilities stress, that this upfront payment for the audit actually provides a better success rates. The companies have already taken the decision to use resources on the first audit, and thus need to continue with the implementation to get the first expenses covered.

Both interviewed utilities acknowledge that this up-front payment restrains some companies, especially smaller ones, from getting involved as they are uncertain about their savings potential and thus if this preliminary expenses can be recovered trough savings. However, they stress that they prefer to work with a smaller number of companies with better likelihoods of realization of identified savings, rather than having a bigger pool of somewhat interested companies, with lower potential of actual implementation.

In the Carbon 20, the energy screening is as mentioned offered free of charge to the companies, but on the same conditions in terms of no restrictions on selling the identified savings. Based on their previous experiences, the two Electricity utilities are a bit sceptical that the companies also will follow up, but do hope that the companies "commitment" in the Carbon 20 agreement will compensate.

While both electricity utilities acknowledge that achieving savings in respect to fulfilling their obligations do play a part in their motivation for being involved in Carbon 20, both add, that a big motivation is also to improve the collaboration with the local authorities and show their presence in network activities among companies. Especially TRE-FOR stresses that their main reason to participate in Carbon 20 is to show their presence on the local green arena and take part in the local networking around energy efficiency, GHG mitigation etc., while the actual saving obligation is, of course, something they hope will follow as well.

TRE-FOR has for that reason also chosen not to be compensated the 700 Euro by the Carbon 20 project for screenings within their main area of operation, but do ask for compensation if going to some of the other municipalities. Contrary to this, SEAS-NVE generally asks for compensation by the projects, unless the companies chose to get SEAS to implement the savings. The compensation is thus their safeguard to get their expenses partly covered even if no further agreements are made.

However, both stress that the cost of having this consultancy, and furthermore also providing it for no or reduced cost, means that they cannot offer the same subsidy for the savings as some of the others actors having abandoned such consultancy activities. They are both, and especially TRE-FOR, therefore somehow sceptical of how many actual agreements on implementation they will manage to get trough Carbon 20. TRE-FOR has experienced that a company, after their screenings, have "sold" the savings to someone else. This makes them emphasise that while they are very positive to the idea of having a closer collaboration between the municipalities and energy utilities, it is very important that the set-up is revised such that a much clearer business case for the consultancies is established. Even though TRE-FOR is mainly participating in Carbon 20 as a platform to promote itself and to network, they will not be able to continue the current set-up after Carbon 20 – there will be needed some kind of adaptation in order to secure their business models e.g. some kind of way to commit the companies to implement the savings identified in the screening.

During the project, one of the bigger energy utilities has chosen not to join because of such concern. Likewise one of the local energy utilities has withdrawn from the projects as they found it difficult to establish a business model on the given terms.

OTHER ENERGY CONSULTANTS' EXPERIENCES FROM CARBON 20

For the two other interviewed energy consultancies, respectively the district heating supplier, Vestforbrændingen, and the electrical equipment supplier, Schneider, the energy saving obligations do only play a minor role in their general business model for conducting their energy consultancy and is likewise of minor or even no importance's for their motivation for participating in Carbon 20.

As a distributer of district heating Vestforbrændingen is very focused on the efficiency of the whole system, and can fulfil their energy savings obligations trough such systems improvements. One of the crucial aspects is that the temperature of the water coming back from the customers is as low as possible. A low temperature here is furthermore correlating with an efficient heating utilisation at the costumers. Vestforbrændingen has therefore established a internal consultancy focused on providing counselling to customers with a high temperature on water coming back providing both savings for the customers, but also optimising the whole system and thus providing Vestforbrændingen a better system.

Furthermore, Vestforbrændingen is trying to expand their covering and especially trying to get several of the business to convert to district heating.

Vestforbrændingen is mainly participating in Carbon 20 to get around to a broader pool of their customers and not just the one where they have identified the biggest improvement options. Furthermore they state, that it is important for a company like Vestforbrændingen to shown their active commitment

towards a transition towards a fossil free energy sector, and support the work for reducing GHG emissions. Vestforbrændingens district heating is based on the incineration of waste and as such counting almost as GHG neutral. A converting from a normal gas fired heating system to a district heating based on waste incineration is according to Vestforbrændingen equal to a 24 % reduction in GHG emission from the company. Without actually being an explicit target of participating in Carbon 20, the involvement has resulted in several new customers.

For Vestforbrændingen the energy saving obligation is not considered having any direct influences in their motivation. Their interest is however restricted to those areas where they physically are present with infrastructure or plan to be in near future as their main focus is existing customers or potential new ones.

For Schneider the saving obligation is also playing a minor role in their business models and none for their involvement in the Carbon 20 project. Schneider is generally a producers and vendor of hardware solutions for the management and distribution of electricity, and thus not obliged to the energy savings.

During the past couple of years, Schneider is trying to move from being supplier of components to be an energy (electricity) optimisation company. Schneider is e.g. very active in finding ESCO (Energy Service Company) models for the public sector. However, for the business sector they find that the fluctuations in the energy use due to fluctuating orders is generally too high and the investment horizons too low with payback times maximum of 3 years to manage such ESCO models. Instead of ESCO models, their general concept for businesses looks similar to the ones of energy utilities.

Schneider also conducts a preliminary energy screening for around 1,500 Euro as a platform for identifying further projects. But where the energy utilities are interested in the savings as part of their obligations, Schneider is focused on the potential selling of the hardware and solutions necessary to implement the savings.

Schneider includes the possibility to receive subsidy for some savings, but mainly as an extra argument in their dialogue with companies for them so continue with the savings and e.g. show a better payback time than without the subsidy. However the interviewee also stresses, that it is generally not the subsidy that makes the big different as it often only reduces the payback time negligible, put in some business with a very high focus on specific payback time no longer than e.g. 2 years they can make a differences.

Schneider sees the Carbon 20 project as an opportunity to expand their platform for talking energy savings with potential customers. As the Carbon 20 project provide Schneider the opportunity to get a focussed talk with potential customers, the Carbon 20 project actually saves Schneider some of the preliminary efforts of establishing the first contacts. For that reason Schneider do only ask for compensation from the projects where they op front considered the company as too small or out of scope to actually be a potential customer for Schneider's main products. In general meaning that for companies having less than 50,000/100,000 KWh Scheider ask for the 700 Euro compensation.

In terms of experiences, Schneider supplement the energy utilities in terms of their experiences of the value of the up front payment contra free of charge. The interviewee further echoed the energy utilities in their concern about the business outcome, but emphasis that there is a longer decision process for the companies in Carbon 20 as several actors are involved. This does however also blur the picture in terms of who is actually in charge of what especially in terms of follow up to secure implementation.

The interviewee stresses however that, the Carbon 20 project should be seen as a pilot project, which naturally has some preliminary difficulties and room for improvement, but the concept of greater cooperation is generally by all interviewees supported.

LOCAL MUNICIPALITIES IN CARBON 20 EXPERIENCES OF USING ENERGY CONSULTANTS

The majority of municipalities emphasise that the use of Energy Consultants has mainly functioned well, and that it has been informative and useful for the civil servants to follow the specific energy screenings and gain more practical experiences of what can be done in business. Several also highlight that the delivered screenings report have been of good quality and pointed at relevant savings.

In spite of this overall picture, the majority also emphasise that it has been a rather blurred process both to understand the concept of the energy savings obligations and its relation to the motivation of the energy consultants involvement in Carbon 20 as well as to get a clear and joint understanding of the different agreements interred and what this means in terms of compensation, cooperation and responsibilities.

This blurred process and lack of common understanding has been experienced by the municipalities as a rather frustrating process where some have experiences that the energy consultants have withhold some of audit report without informing the municipalities about it. Especially Herning have experienced difficulties with their communication with the local energy utility feeling that they went behind the back of the municipality. Herning have thus chosen to stop the cooperation, and plan to use some of the other consultants.

On the other hand, Ballerup emphasises that they have had a good cooperation with especially Schneider and Vestforbrændingen, who both are local actors within Ballerup. Using local actors do in Ballerup's opinion provide better room for network cooperation and point out that Schneider e.g. have arranged some pre-screening meeting with several companies that have been very informative.

All of the municipalities further emphasise that after Carbon 20, the municipalities will most likely not have the funding for using 700 Euro per company, so alone for that reasons a changed praxis needs to be established.

This will especially be a challenge in respect to find a model targeting the smaller firms. Especially Copenhagen emphasises that the majorities of companies belong to the category of small companies. By themselves these smaller companies often poses rather low saving potential, but in the overall picture it ads up to actually constitute a major part of the actual used energy in the business sector.

The municipality of Copenhagen has generally experienced, that most energy consultants are reluctant to work with the smaller companies. According to the interviewees from Copenhagen this relates both to the fact that there is little actual potentials, whereas the cost of screening and measure of such

might outweigh the actual savings identified, but further that smaller companies often also lack the motivation as the energy bill only count as a minor expenses, whereas other aspects is prioritised. Even for those smaller companies committing themselves in the Carbon 20 projects, the smaller companies often have difficulties finding the necessary resources to implement savings.

Copenhagen has for that reasons hired a student employ to actually help the SME implement the savings. So even though they find the report quite good and informative, these are often not enough to make the SME actually implement them.

The interviewees emphasises that the consultants in the Carbon 20 projects do perform screenings of the smaller companies, but do believe that it is solely because of the established agreement and that most of them would not continue their activities under these terms after Carbon 20.

Copenhagen have also tried several other schemes and consultant, but have had difficulties finding a set-up that all actors find attractive. One of the more promising approaches have been to engage local smaller electricians and other craftsman to do the screenings, however only one seems to manage to actually get a business models that works. However several other municipalities e.g. Allerød, Frederikshavn and Middelfart/Odense, Sønderborg are also trying to organise their local craftsman and upgrade their knowledge in respect to energy and climate, but these seems mainly to be targeted the household, but could eventually also functioning in respect to smaller companies.

Conclusion

During the last couple of years, the obligations for energy utilities to save end-use energy have become an important policy tool for achieving increased energy efficiency in society. Several authors have addressed this policy tool from several perspectives and several evaluations of especially the 4 European schemes in UK, France, Belgium/Flandern and Denmark has been carried out. This paper has supplemented these by investigating specifically how such schemes might be activated in a municipal setting of engaging the local business sector.

In a specific Danish project, Carbon 20, the main concept is to engage energy consultants in reducing CO_2 emissions from small companies, and several interviews have been made with both the municipalities and the energy consultants involved in order to investigate these potentials and barriers.

Concluding on the findings, both municipalities, energy consultants and especially small and medium-sized companies have a profound and shared interest in collaboration and development of a common approaches since the single actor can not alone realize the potentials for reduction of CO_2 emissions. However, the current agreements do not quite seem to induce the full potentials.

First of all, the specific set-up with the no payment from the companies makes the energy utilities fear that companies will not be committed to the implementations fulfilling their needs in respect to reporting the savings and thus their possible gains from the involvement.

Secondly, there have been quite some misunderstandings about how to interpret the agreements and some feelings of withholding information in that respect.

Finally, it has been a challenge to engage consultant in providing audits for the smaller companies that only have little energy saving potentials as well as limited interest and capabilities for using time and man-power resources.

In contrast to several of the different evaluations (among other Lees 2012), who specifically point at the specific counselling of SMEs as one of the attributes of these energy saving obligations, this investigation shows that the scheme in Denmark fails to address the smallest companies with solutions that fit their needs and constraints. Such small companies have difficulties paying for a screening up front, since the payment is relatively a larger cost especially compared to their general energy expenses, why potential payback periods are also expected quite long. A further challenge is that even when the small companies do commit to energy savings, they often do not possess the resources to actually implement the solutions.

As the scheme is now, focus is generally on achieving cost effective savings meaning focussing on the bigger energy consumers. The latest political agreements decision to cut funding for the knowledge institution "Go'Energy", who among others specifically was targeting SME highlights a potential lack of suitable solutions for addressing SME.

To conclude on the question raised in the title: Can energy utilities play a role in local energy savings programs?

The simple answer is: YES, they can and seems willing to do so.

However, it does require a closer assessment of how to organise the arrangement in order to secure that the different interests are accommodated so win-win-win situations are established being both an active for the municipalities, the energy consultants as well as the companies.

As the project is still on-going, it is to early to conclude if the project will manage to find a suitable set-up accommodating such a win-win-win framework, but as one of the central recommendations from the first monitoring report (not yet published) of the Carbon 20 it was recommended specifically to address how to expand and consolidate the future cooperation also after the EU funding and currently initiatives is starting to be taking to discuss this.

Perspectives

It has been out of scope of this paper to specifically address how to strengthen the work and find options for addressing small companies. However, during the interviews several different perspectives for how to strengthen the cooperation and make a targeted solution for small companies were discussed.

Some ideas for further assessment and discussions among the involved actors include (some of the approaches presented could be complementary):

- **A closer cooperation and exchange of knowledge.** SEAS-NVE stresses, that they conceive that both the municipalities and energy consultants/energy utilities could gain in their dialogue with companies trough a closer cooperation and exchange of knowledge in order to get a more complete picture of the company in question. From SEAS-NVE perspective it would be very valuable that the municipalities include energy efficiency in their dialogue with companies either as part of their general enforcement activities

or in other forums to identify saving potentials, and then point at different energy consultants to get further assistance to implement the savings. Furthermore, the municipalities themselves could contact the energy consultants to point at specific companies. Then the energy consultants can make an agreement regarding a screening etc. following similar models as applied generally, but potentially with rebates as municipalities have identified a certain potential and saved the consultants for the preliminary promotion activities and establishment of the contact. SEAS also believe that the energy utilities do possesses a lot of knowledge about several of their customers e.g. related to the energy bill that could be of value for the municipalities in their communication with these companies where an improved dialog between all partners could be relevant

- **Re-inventing the "No-cure, no pay" scheme.** As mentioned earlier the energy utilities used to provide the screening free of charge, but with some clauses related to the realisation of the identified savings and subsidy. In many ways this approach could mirror similar approaches for a no-cure, no-pay counselling – practised earlier among others by the former Environwise in the UK in respect to resource efficiency and waste. While the approach have been abandoned again due to confusion and questions related to the possibility for receiving subsidy that exceed the value of the preliminary screenings, there might be some perspectives for reintroducing a similar mechanism targeted the small companies. TRE-FOR e.g. suggest that if the companies do make a "political" commitment to certain reductions as part of voluntary agreement with e.g. a municipality (like in Carbon 20), such commitment might be acknowledge to back up a reimplementation of such no-cure, no pay solutions, where the subsidy for the potential savings pays for the preliminary screenings. To secure that the approach doesn't work counter-productively (give incentives for postponing savings until the agreement is not valid and then sell to others) there could be built in some upper limits or maximum level over which subsidy will get distributed back to the companies. Also SEAS seems very interested in discussing if there are possibilities for rethinking such no-cure, no pay models. The suggestions from the recent evaluation to cut the subsidy options for savings with short payback times might actually facilitate such as several of the savings will not be subject for subsidy.
- **Establish a total energy saving packet for SME including assistance for implementation.** As highlighted e.g. by Copenhagen one of the biggest constraint for SME is actually allocating resources (man power) for the actual implementation where e.g. Copenhagen in addition to the screenings report have hired a student employ working specifically with this. A further discussion with the energy utilities and other consultants should also address how it is secured that the implementation is covered in respect to SME. An idea while in a situation with high unemployment inspired by a Swedish municipality promoting EMS (Von Malmborg 2007) could be to make it a targeted part of the unemployment policy to get re-educated and involved unemployed craftsmen, newly educated students etc. in offering targeted implementation guiding.
- **Applying the calculated average data for SME.** The earlier mentioned ECEEE evaluations of the 4 European Energy saving obligation schemes also highlight that several countries including Denmark has established some standard average data for the achieved savings by different specific solutions. The object of these is to lower the cost of measurement of especially households. In Denmark among others SEAS-NVE has developed a web application tool based on this, where preregistered craftsmen can report the savings they achieve at customers and TRE-FOR is also implementing similar platforms. The main target of the portal is craftsmen working at households, but it seems reasonable to expand to include craftsmen work in small companies as well. A role for the municipalities could thus be to engage the craftsmen and electricians to get involved with the business and use the portal (or similar) to report the savings and receive and distribute the subsidies.
- **Pooling of similar small companies.** Schneider does not see the small companies as potential customers in general and are thus not that interested in developing its activities in this segment. However, they did point out that if the company is part of a bigger chain or have a common ownership structure with other similar companies, they might still be of interest due to economics of scale. One of the civil servants in Copenhagen municipality mentioned the possibility of a similar model, where the municipalities could function as a pooling of similar small companies located close to each others in similar buildings etc. in order facilitate a economies of scale, "fast and dirty" screening of several similar companies utilising standard average data.

There might of course be several other supplementing suggestions and ideas, but these could function as a departure point for having a more in-depth discussion.

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CHAPTER 8. THE ARENA OF PUBLIC BUSINESS SUPPORT AND GREEN GROWTH

This chapter is the final of the three chapters that looks into the municipalities' regimes of practises within a specific Governmental Arena – here the municipalities' activities for local business support and green growth. In this chapter, insights and suggestions are provided for how municipalities can take an active lead in local green growth combining the climate and environmental agenda with the renewed focus on the public as driver for growth and business development.

The chapter is based on the experiences of the Carbon 20 municipalities and especially the facilitated exchange of experiences on the green growth agenda. Four workshops were arranged that in total addressed the municipalities' options and experiences within six topics (sub-arenas): 1) Overall business strategy and policies; 2) Direct business support, 3) A service minded public service to companies, 4) Promotion of employment, 4) Public procurement and tendering, and 6) Public Private Partnership and innovation.

The facilitated exchange of experiences thereby purposefully addressed the practises of the municipalities within otherwise distinct task and also brought officers together from different organisational units. The arena addressed in this chapter is thereby already representing an emerging merging of several traditional rather distinct arenas – these six topics are here therefore called sub-arenas.

In the previous chapters, the respective arenas analysed was rather specific. The analyses of the municipalities' regimes of practise within each of these were among others used to provide a critical view on the regulatory framework of these two arenas.

The institutional and regulatory framework addressed in this chapter is much broader covering different settings within the six sub-arenas. The analyse of the regimes of practise within this merging umbrella arena is therefore first and foremost an exposing of the multitude of means and governing techniques that are applied on the green growth and -transition agenda within and across traditional institutional and regulatory boundaries of these six sub-arenas in contrast to more critically assessment of the framework itself.

The discourses that affect the regulatory settings and municipalities' practises within and across these sub-arenas equally cut across and interlinks otherwise rather distinct academic discussions related to: public policies on (local) business development, innovation and growth as well as Public Private Partnership. The analyses of the "Discourses within the Arena" (subchapter 8.2) is therefor more extensive than the theoretical parts of the previous chapters (papers).

The chapter first explain the background for the decision to address the green growth as a specific element in the Carbon 20 project. This is followed by a presentation of the main discourses and academic discussions within diverse academic field contributing to frame this umbrella arena.

The core of the chapter is the analyses of the merging practises of the municipalities within the six sub arenas addressed during the four workshops. Each topic (sub-arena) will form subchapters that each outlines the EU and/or national regulatory framework, the practises of the municipalities as well as the emerging attempt to link such towards the green growth discourse.

8.1. THE CARBON 20 FACILITATED EXCHANGE OF EXPERIENCE ON GREEN GROWTH

During the Carbon 20 project, it was decided to organise a facilitated exchange of experiences on how municipalities can act as public driver for Green Growth.

The decision to emphasise this as an element of the Carbon 20 project derived from a growing interest in the steering committee lead by the vice-director of Albertslund municipality, Carsten Blume, in finding synergies by using the increased focus and formal responsibilities on supporting a local business sector to also implementing other municipalities agendas – including climate change mitigation.

The recent years debate on public policies for growth and development have re-emphasised the active role of public authorities. The combined crises of respectively climate, economy, shortage of food-supply and scarcity of resources (Nielsen, 2012) has called for the public to take a lead in terms of directing innovation and industrial development towards addressing such grand challenges (e.g. EU 2020 strategy). Popular speaking, the Danish think-tank (Mandag Morgen) has framed this as "picking the problems" in contrast to the traditional conflicting business support approaches of either "picking the winners" versus "levelling the playing field" (Farla, 2012; Møller & Strand, 2011).

Equally concept such as Shared Value and Public Private Partnership represent a change in discourse away from the traditional distinction of either private or public to an increased focus on joint responsibilities and collaborations on shared goals

and new innovative ways to do things (Hodge and Greve, 2009; Porter and Kramer, 2011; Sørensen and Torfin, 2011; Weihe, 2007).

Globally, several international institutions such as OECD and UNEP argue that the climate change agenda calls for a transition towards a green and sustainable growth paradigm – a "Global New Green Deal" – where investments to address environmental challenges can reboot the economy (OECD, 2009; 2011; UNEP, 2009; 2011).

EU similarly argues in its growth and job strategy: "EUROPE 2020 - A strategy for smart, sustainable and inclusive growth" for public and private investments and collaborations to address the grand challenges of the current society (European Commission, 2010a; 2010b; 2010c; 2011).

The Danish government (2011) also sees a green growth strategy as a central contribution to get out of the crisis. Investment in especially energy efficiency, renewable energy, resource and energy efficiency and -reutilisation shall boost an economic recovery as well as job creation. The government calls for the public sector to take a lead in finding innovative ways to collaborate with the private sector in order to achieve these goals e.g. through public-private partnerships (Regeringen, 2011; Regeringen, 2013c).

The government has published several strategies centred on how to reboot the Danish economy under the headline "Denmark back to work". This includes both overall strategies related to the general policies including public procurement, but also specific strategies within seven prioritised sectors of which several relates to different clean tech solutions and/or green elements (Regeringen 2013d; 2013e; 2013f; 2014).

Equally, the government has enlarged the already existing different support programmes on the green agenda covering especially the three development and demonstration programmes of respectively energy technology, green agricultural technology and environmental technologies (EUDP, GUDP and MUDP), as well as established programmes targeting new green business models (e.g. Cradle2Crandle and product service system), Industrial Symbioses as well as overall green transitions. The government also specifically emphasising Public Private Partnerships and active use of public purchasing as some of the means to apply for steering this green transition (Erhvervsstyrelsen, n.d.-a; Regeringen, 2011).

In line with the government's recent emphasis on this green growth agenda, several Danish municipalities are increasingly also beginning to take actions towards such. The municipalities see themselves as central positioned actors for making this transition happen in direct interactions with citizens and the local businesses.

In an administrative reform of the public governance structure in Denmark, the former 14 counties were terminated and replaced by five Regions. The municipalities were contrary enlarged to become bigger units – from 271 municipalities before the reform to 98 municipalities after the reform. The majority of the tasks of the former counties were distributed to the now enlarged municipalities or in some cases the state, whereas the regions primarily focus on the public management of the hospitals and some overall responsibilities in respect to overall regional development (Indenrigs og Sundhedsministeriet, 2005; IRIS Group, 2010; Strukturkommisionen, 2004; Økonomi & Indenrigsministeriet, 2012; see also Bundgaard and Vrangbæk, 2007; Vrangbæk, 2010).

Before the reform, the counties were centrally placed in terms of regional business development and support. After the reform the municipalities have instead got increased responsibilities on the business development as well in respect to – in cooperation with the region – set the direction for the overall regional development including also prioritisation of EU and national funds such as e.g. varies business support programmes (IRIS Group, 2010).

The business support sphere is thus an area, where the regions still have some responsibility, however significantly reduced compared to the former counties as some of the responsibility is distributed to the enlarged municipalities. This has resulted in networked governance structure with shared responsibility between the region and municipalities on the overall regional and business development and with a specific responsibility to also involve various other non-governmental interest organisations. Furthermore, the previous more than 25 business support units anchored in the counties were concentrated into five so-called "Growth houses" in principal under a joint collaboration of the municipalities within the regions rather than the region (IRIS Group, 2010; Sehedsted, 2010; Sehedsted and Lund, 2010; Sehedsted et. al, n.a).

The municipalities have thereby been provided increased responsibilities in respect to business development. This relates to:

1) Collectively together with the region and key stakeholders agree on an overall business development strategy for the region including the implementation and execution of national and EU funding programs
2) The main public actor in respect to providing direct support for companies. This relates to both (the option of) providing direct general support to e.g. companies that want to start a new company within the municipality, but also as collectively "owner" of the established, specialized business support unit named "Growth houses" that are to provide a more targeted support.

Following the reform, the Danish economy was (along with the global economy) hit by a downturn, whereas several municipalities experienced decline in employment and in the local business sector. This made several municipalities in the Carbon 20 project to emphasise the need for an active support of local businesses and further argued for having this as a central overall objective in most activities of the municipalities.

As a response to these considerations – the enlarged formal responsibilities, the economic crisis, as well as the increased debate on green growth – the steering Committee decided to reorient a broad task into a more targeted focus on the linkages to business support and green growth in terms of a facilitated exchange of experiences between the participating municipalities.

The objective was to discuss how to use this enlarged responsibility toward business support actively as platform for strategically engaging business to contribute to the municipalities' agendas of Climate Change and green transition. While departing in the municipalities' increased formal responsibilities on the business support, the exchange of experiences covered also how the municipalities could integrate the two perspectives of both business support and Climate Change into other municipal tasks including links to job creation, public procurement and tendering, as well as entering Public Private Partnerships.

During the course of the project, four workshops were organised covering topics of interest. Each workshop included the officers from the municipalities relevant for the specific topics in addition to (or instead of) the officer otherwise involved in the Carbon 20 project.

During the four workshops, six topics – sub-arenas – were addressed with the crosscutting theme of linking the growth agenda (business development, employment, etc.) and the green agenda (improving energy and environmental performance) throughout all the different activities of the municipalities that has interference with local companies.

1. Overall business strategy and policies
2. Direct business support – structure and organisation
3. One stop shop – smooth public service to companies
4. Promotion of green employment
5. Public procurement and tendering,
6. Public Private Partnership and innovation.

These topics were mainly picked out because of political focus and/or judged that there were some relevant experiences to share. As already argued these topics each cut across both several different, but converging, discourses and academic discussions on the public role in business development, innovation and public

private partnership, as well as relates to several different (EU and/or national) regulatory frames.

8.2. DISCOURSES WITHIN THE ARENA

As argued above the activities taken by the municipalities in respect to this green growth touches upon several different discourses previously addressed and discussed as rather separate academic research fields.

In this section these different academic discussions are presented showing that this renewed focus on the public role in tailoring business development towards societal challenges indeed interlinks recent changes in discourse within these different academic fields pointing actually at some emerging merging of different discourses and academic discussions.

The subchapter introduces here the altering in discourses within distinct academic discussions of: Public policies on business development and growth, Regional Development, Innovation Dynamics as well as Public Private Partnership. The point is, that altering in discourses within each of these fields point towards some overlaps and merging; and that they all affects how the municipalities attempt to merge their practises to address this green growth agenda.

PUBLIC POLICIES ON BUSINESS DEVELOPMENT AND GROWTH

UNEP applying the term "A global new green deal" in their 2009 publication provides a (indirect) reference to US president Roosevelt's New Deal reform in the 30s, The core of this were specifically to suggest an active public policy to get out of the "great depression". The UNEP publication thus marks a withdrawal from the so-called "Washington consensus" and the general free market centred policies as the advocated road to growth.

The "Washington consensus" was itself a questioning of the "old" "New Deal" school, where governments actively assisted a small number of large national champions in terms of "picking the winners" (Møller & Strand, 2011) – or "pro-business policies" (Farla, 2012). Instead the more liberal move suggested to restrict the direct role of the public as "levelling the playing field" (Møller &Strand, 2011) – or "pro-market policies" (Farla 2012). Such consisted e.g. in basic research, education and ease the start-up of new entrepreneurs and SMEs to provide increased competition towards the old national champions (Farla, 2012; Møller & Strand, 2011; Stiglitz, 2011).

The Washington consensus doctrine and the restricted role of the public are being questioned advocating for a reintroduction of the state and public as driver (see e.g. Stiglitz, 2011). UNEPs reintroducing the New Deal build on such questionings.

Mazzucato (2013) has e.g. in her "The entrepreneurial state – Debunking public vs. private sector myths" presented a strong argument for the need of active public policies to boost innovation, and thus business development and growth within selected strategic areas. She argues that the state has played a driving role for several industrial innovations and growth successes of the past decades by both engaging as an entrepreneurial investor that takes the high-risk basic research and developments investments, but further linking it specifically to possible (public) applications – demanding new technological development to be applied in e.g. in the military sector or the moon project etc. (Mazzucato, 2013). She illustrates, how the US government has played a significant entrepreneurial role for the development of several technological innovations that now forms the basics of the IPhone (Internet, GPS, touchscreen etc.). She therefore calls for the states (and the public in general) to take the lead for the next most needed acceleration of innovations and uptake of clean tech solutions (Mazzucato, 2013).

Farla (2012) argues that the reintroduction of the public as driver for business development has taken a different approach than the previously "picking the winner" approach. In contrast to earlier "pro business policies", such business support policies and support mechanism are now kept transparent and open in order to not jeopardize competition, but tailored towards sectors and/or area of societal concern (Farla, 2012; Møller & Strand, 2011). Farla (2012) refers that such has been framed as a matrix- or pragmatic approach (Farla, 2012).

THE REGIONAL FOCUS ON BUSINESS DEVELOPMENT

The pragmatic matrix approach is not new. Already in the 1990s, Porter provided a combined perspective on the role of the public in respect to business development. He specifically positioned his approach as oppose to both the "pro-business" policies of nurturing a few national champions (picking the winners), and to the alternate concept of pro-market policies focussed on enlarging the market through free trade and transparent markets (Levelling the playing Field) (Porter, 2008b; 2008c – updated versions of publications from 1990 and 1998).

Porter analysed the competitive advantages of different nations in a globalised economy and the increased competitions between various nations and/or localities (within and across nations). Porter found that localities do matter for companies' competitive advantages, where interrelated companies clusters in specific regions (Porter, 2008b; 2008c).

Porter further argued that both national and local/regional public entities have several distinct roles to play in respect to affecting each of these elements (Porter, 2008b; 2008c). In addition to the basic factor conditions and overall markets oriented policies typically in focus of the more liberal business support oriented policies, Porter also calls for policies directed at both facilitating and upgrading present clusters of companies as well as provide long term goals and regulatory frameworks. Porter specifically argues that while national state has a profound role in respect to overall regulatory framework, the local and regional public entities have a role in respect to the facilitation and upgrading of the clusters (Porter, 2008c).

Cooke (2012) has extended on Porters concept of cluster in terms of what he frames as "platforms". He does acknowledge Porter for pointing out that industries indeed clusters around some of his highlighted mechanisms, and that both states and local public entities have significant roles to play in the continued development of such clusters. However, he specifically argues that policies solely focussing on shielding the clusters may end up closing the companies as they may fail to develop in respect to altered conditions globally. He instead argues that more emphasis should be put on forward-looking policies to upgrade the clusters in terms new spin-off possibilities to other industries.

Cook's distinctions between clusters and platforms relates specifically to the boundaries and its implication for what is perceived to be of focus in the policies. He defines cluster as specialised concentrations of interrelated companies in a localised setting, whereas platform is a complex combination of clusters and non-cluster industry that operate in fields of related variety. The latter has thus a broad portfolio of different linkages within and among different types of companies covering both companies localised in proximity as well as more globally oriented relations.

One of his central points is precisely that policies should facilitate existing clusters towards becoming platforms by integrating a variety of different inputs, instead of shielding the clusters from external competition. Cooke argue that innovations in general calls for a cross sectorial open-ended focus, and further emphasises that this is even more so in respect to clean tech and eco-innovation as well as technological development related to the other grand challenges (Cooke, 2012).

THE INNOVATION PERSPECTIVE

Similar to Cooke, the system perspective on innovations also operates with some distinctions between geographical -, sectorial - and/or technological interlinkages as central for the innovation outcomes.

The system perspective on innovation extends the traditional linear view of the innovation process as following a technological push from new scientific discoveries through industrial research and technological development to market diffusion and application.

Rothwell (1994) opposed such tech push understandings. He argues that several promising scientific findings has never made it to the market, while opposite several successful technologies have been the result of engineering trial and errors in respect to experienced needs rather than the result of basic scientific research. Therefore, he adds a market (or demand) pull mechanism forming a simultaneously opposite effect on the direction of the innovation to the technological pull; making it an interactive, iterative process with both a tech push and demand pull feed-pack mechanism effecting each step of the innovation processes (Rothwell, 1994).

Lundvall (2011) supplement this arguing that such iterative innovation processes take part within specific societal, political and institutional settings affecting the various feedback mechanisms in multiple ways. Lundvall together with Freeman already in 1992 framed this as National Innovation System (NIS) emphasising that specific national political frames and policies are crucial for the actual innovation processes. This further implies that the state has a central role to play in terms of forming and directing such innovation processes through various ways of effecting the functioning of the system (Lundvall, 2011).

While originally applied as a lens for assessing different national innovation systems, the system perspective has further been applied in respect to regional-, industrial- and technological innovation systems emphasising that not only national differences influences the innovation process, but technical character and the dynamics of the particular sector also has significance. Looking specifically at the Danish Energy Innovation system Borup (2009) e.g. has assessed different sectorial/technological subsystems of the overall Danish national innovation system of energy technologies (Borup et al., 2009; Lundvall, 2011).

Applying a specific transition perspective, several scholars – using different theoretical distinctions – have emphasised that technological development often follows specific path or trajectory of incremental improvements of existing dominating technological solutions. Technological development takes place among the mutual interactions of several different actors within specific contextual and institutional settings. The technological innovations are both shaped by, but also reshaping, the different societal frames and institutional settings (co-producing), which together form specific technological-, economical-, social- and institutional lock-ins for the actual technological development. Such socio-technical lock-ins has been framed as e.g. technical-economic paradigms, socio-technological regimes or arenas of development (e.g. Kemp & Rotmans, 2005; Jørgensen, 2012 Garud, Kumaraswamy & Karnøe, 2010; Saviotti, 2005; Schienstock, 2005; 2011). Moving

society towards sustainable development requires a transition of these regimes or paradigms – unlocking the lock-ins to create a new path – or as Schienstock (2011) formulates it to move from a "path depended" development towards "path creation".

The public is viewed as a central actor to interfere in those processes to foster such transitions of otherwise rather stable incremental developments. Similar to Porters distinctions between policies (at national and EU level) affecting the overall framework as well as policies (at local/regional level) to upgrade specific clusters, the transition literature also calls for public actions on multiple levels[38]. A transition in development path need policies that alters the rules of the game in terms of adjusting the regulatory frames posing a change in the overall socio-economic landscape; adjustment in the specific institutional settings and supporting infrastructures in terms of "stretch and transform" the regimes and paradigms and/or redefining the "arena of development" wherein the configurations are established and maintained; as well as shielding, nurturing and even engaging in specific niche development and trials to support and provide alternatives to the current path dependent trajectories (Jørgensen, 2012; Kemp & Rotmans, 2005; Schienstock, 2005;2011; Smith and Raven, 2012).

While the overall institutional frames are decided on a national or international level, the local political level is the ones administrating them and further the public actors centrally positioned to actually engage in the different transition processes (Jørgensen, 2012; Kemp & Rotmans, 2005; Schienstock, 2005).

Rennings (2000) has in respect to eco-innovation argued that policies and regulations have an effect on technological development and argues that this is crucial for the development of new and better solutions to counteract market failures – environment as externalities. He argues that policies and regulations can affect the technological development trough interfering in both the technological push as well as market pulls mechanism. Rennings therefor introduces public regulations as a third push/pull mechanism indicating that some policies influence the push for technological development while other influences the market pull. His perspective with this is dual in terms of both emphasising that environmental policies and regulations have a significant role in stimulating eco-innovations, but further that the innovation perspective should be emphasised when designing such policies and regulations (Rennings, 2000).

[38] The Multilevel Perspectives is a specific framework for viewing the innovations processes as interdepending on various dynamics at multiple levels in terms of the overall socio-economic landscape, the dominating socio-technical regime(s) as well as different niche development (e.g. Kemp & Rotmans, 2005).

Extending on the demand side and market pull mechanism, Miles and Rigby (2013) introduce what they frame as Demand-Led-Innovation policies. They distinguish between two different objectives of such: 1) policies aimed to affect, promote and improve companies responsiveness in their internal development, innovation and design processes e.g. improving their capabilities to respond to market signals, user needs and –feedback etc. (demand-driven innovation policies); and 2) policies aiming at influencing and altering the demand conditions themselves and its stimulus for the direction of the innovation processes (demand-based innovation policies) (Miles and Rigby, 2013).

In respect to policies directed at changing the demand conditions Rosted et al. (2009) has framed two different options of "smart regulation" and "intelligent public demand". SMART regulation affect the market demands indirectly as companies seek solutions to fulfil the requirements, whereas intelligent public demands is a direct attempt to pose a specific market signal (Rosted, 2009).

Porter and van der Linde (1994) argues that strict (but smart[39]) environmental regulation can – oppose to conventional assumptions – provide competitive advantages by directing companies to address existing inefficiencies as well as provide them with a first mover advantage given that strict regulations are followed by others countries or international arrangements. They introduce the concept of a double dividend as both improving the companies' competitiveness and the environment – also known as win-win strategies in the pollution prevention literature (Porter and Van der Linde, 1994).

In respect to the public demand as driver for innovation, Edler et al (2012) distinguish between procurement that is responsive in respect to the diffusion of existing innovations versus procurement that is proactive in terms of triggering new innovation. The public can first and foremost contribute to creating lead markets by require standards that only a certain proportion of the available solutions can fulfil. The public can however also specify needs that require innovation to find new solutions not yet available. The latter is referred as R&D procurement. Such R&D procurement can further takes various forms in terms of e.g. specific innovation

[39] The use of the wording of SMART regulations is taking from scholars of Ecological Modernisation. Equally to Porters double dividend, Ecological Modernisation also emphasise a double win-win and the business rationality of eco-innovations. The point is that environment will become part of a modernisation of business. Several of the writers do however still point out that the public has a role in respect to direct companies in such directions. The SMART regulations is attempting to catch that the regulation should be conducted so that in induces the private actors to innovate and implement such win-win strategies in contrast to inflexible norms demanding specific costly solutions (e.g. Janicke and Jacob, 2005; Janicke, 2008)

partnering about the development and testing of new solutions and/or long run service contracts with requirements to continuous improve on specific parameters (Edler et al., 2012).

Extending on the concept of double dividend, Porter and Kramer in 2011 introduces the concept of "shared value", arguing that companies should focus on strategies targeted at making money by providing goods or services that have a societal value. Porter still emphasis that the public has a central role to play in respect to (Porter and Kramer, 2011):

- Point out areas of societal values – e.g. challenges that need to be addressed;
- Provide the regulatory framework that direct business towards such challenges, as well as
- Engage as a central partner for finding new business models directed towards such double dividend.

In the field of pollution prevention, the concept of "double dividend", win-win and new business models have been high on the agenda e.g. in the discussion of Sustainable Consumption and Production (SCP).

Under various concepts such as: Product Service Systems (product based services), Cradle-to-Cradle, Extended producer responsibility, industrial symbioses and Industrial Ecology etc. various business models are discussed aiming at decoupling the resource use of producing new products and services (e.g. Lindhqvist, 2000; Manzini and Vezzoli, 2003; McDonough & Braungart, 2002; Malmborg, 2004; Mont, 2002).

This involves e.g. to move the commercial focus to the service and use (the function) of the products rather than just selling the product. The idea is that this provides incentives to prolong and/or repair and update the product as carrier of the function that are sold. Examples include e.g. ESCO, Chemical leasing, professional leasing of ICT equipment (XEROX) etc. Other business models are to establish take-back systems that establish potential feedback loops between the product design and the product as waste etc. The industrial symbiosis concept centres on business models, where (neighbouring) companies are partnering about reutilisation of each other's waste streams (Lindhqvist, 2000; Malmborg, 2004; Manzini and Vezzoli, 2001; McDonough & Braungart, 2002; Mont, 2002).

PUBLIC PRIVATE PARTNERSHIP

As shown Porter and Kramer (2011) suggest that the public should partner up with the private enterprises as one of several task for foster the companies to address the grand challenges. Porter and Kramer thereby contribute to interlink the latest

decades discussion of Public Private Partnership directly to this "new" matrix approach to business and growth policies of "picking the problems".

Conceptually, Public Private Partnership (PPP) is often defined rather broadly centred on the idea of shared goals and objectives. Equally, the term is applied to covers a wide variety of constellations, where public and private entities collaborate on more or less shared targets (Linder, 1999, Weihe, 2007; Hodge and Greve, 2009). Hodge and Greve (2009) e.g. identifies five different families of public private partnerships (Hodge and Greve, 2009: 1):

- Institutional co-operation for joint production and risk sharing.
- Long-term infrastructure contracts.
- Public policy networks.
- Civil society and community development.
- Urban renewal and downtown economic development.

While emphasising such broad and diverse use of the term, the term is most often used in a rather restricted manner in respect to contractual arrangements between the public partner as a demander and the private partner as a supplier of specific goods and/or services (e.g. the Wikipedia explanation of the term).

As such the Public Private Partnership discussions are to be seen in relation to – and extension of – the traditional New Public Management (NPM) debates on public outsourcing and privatisation.

Savas (2005) e.g. discusses PPP as one specific constellations of what he al together frame as "marketization" and "commercialization" with the same overall objective to engage private sector actors to perform the public services more efficiently (Savas, 2005).

Conversely, Sørensen and Torfin (2011) sees the public private partnership as part of an emerging change of view on the public administration emphasising innovation as way to gain qualitative improvements of the public services and not just efficiency gains.

Sørensen and Torfin (2011) argue that the NPM focus on streamlining the public administration is increasingly supplemented by increased expectations for simultaneous quality improvements. This therefore calls for innovating new practises that – contrary to NPM – manage to increase the effectiveness and not solely efficiency of public administration and services. Sørensen and Torfin frame these current developments as "collaborative innovation in the public sector" (the tittle of their book, here translated from Danish). They emphasis that this relates both to internal public capability to innovative, but also to do things together with

the private sector in stead of the previous thinking of either public or private (Sørensen and Torfin, 2011).

Public Private Partnership as a narrow contractual arrangement originates as an approach to raise private money for public construction tasks. This is, however, increasingly broadened in focus and scope into covering public tendering in several diverse fields – in Denmark especially discussed in relation to social services and health care.

Traditionally, the tendering of either goods or services focuses either on the final physical delivery (the construction or product) or the operation of a service (such as e.g. outsourcings of cleaning at hospitals – emphasis and measuring on the cleaning process and not clean as the qualitative outcome). PPP instead links the designs, implementation and operation into one tendering process that both contain a longer lifespan than traditional tendering, but further centred on a more flexible contract focussed on the function instead of rather fixed specifications of either the product to be purchased/build or the service to be carried out (Hodge and Greve, 2009; Weihe, G. 2007).

Applying a longer timeframe centred on the functionality allows for including incentives for more innovative improvements; exactly the point with the concepts of public R&D procurements mentioned above. The concept is that the linking of design and use allow the private entities to incorporate the running cost (lifecycle cost) in the design. Understood as such, the PPP further resemble a specific public application of the concept of Product Service System.

Equal to the distinction under R&D procurements in terms of respectively longer contract allowing for introducing new technologies when available vs. specifically demanding the innovation of new solutions, the PPP discussions are – at least in Denmark – also being broadened in terms of also addressing the latter. The Public Private Partnership term is in Denmark extended to the concept of Public Private Innovation (PPI[40]). This term captures specific public private partnering constellations focused to develop and test new products as "prove of concept" before entering specific procurement decisions. Contrary to the PPP, such PPI implies specific joint cooperation on the development and/or testing of projects and new solutions that is of relevance for the public services and challenges. Any specific procurement decision is left for later specific tendering and procurement decisions (KL and Udbudsportalen.dk, 2010).

[40] In Danish: Offentlig Private Innovation (OPI) as extension of Offentlig Privat Partnerskab (OPP)

The term PPP is as mentioned also applied much broader covering several diverse forms, where the public and private sector collaborate to reach common shared goals that not necessarily imply any contractual arrangement for carrying out specific task. This takes all kind of different organisational setups including: networks; joint declarations of cooperation; voluntary agreements; the forming of an overall secretariat/board; as well as formal joint companies or entities. The Danish municipalities have actually a rather long tradition for the latter in respect to e.g. public utilities etc. (Weihe, G. 2007).

Relevant for the Carbon 20 project, Malmborg (2003) uses the term in relation to Swedish regional development projects about the municipalities' active promotion and facilitation of the uptake of environmental management systems by local companies. In this partnership constellations, the local public entities specifically engage companies in a rather loose network organisation centred on facilitating the local companies to implement EMS – either conducted by municipalities themselves or hiring consultants to execute the facilitation (Malmborg, 2003; 2004).

Extending on among others Malmborgs' understanding of public-private partnership, Lehmann (2008) adds academia making it a Public-Private-Academic-Partnership (PPAP). Lehmann still focuses on the role of the public partner as the ones orchestrating the network cooperation to disseminate EMS, however in cooperation with academia (Lehmann, 2008).

Etzkowitz (2008) equally to Lehmann also address this triple partnering among those three actors with his concept of Triple Helix (Etzkowitz, 2008).

Etzkowitz main focus is opposite on the universities were he argues for a "new" role of engaging and partnering with the business sector in the production of knowledge. His focus in relation to the public is mainly restricted towards the different funding schemes arguing that such should become more ventures and entrepreneurial. Contrary, Lehmann emphasises that the public (here local authorities) also has an active facilitation role as well as often being the one orchestrating the cooperation (Etzkowitz, 2008; Etzkowitz & Leydesdorff, 2000; Lehmann, 2008).

Lehman does also draw on the innovation literature (e.g. Lundwall) as inspiration of the role of academia as carrier of the innovative perspectives – Etzkowitzs' main focus. But where Etzkowitz focus is mainly on the joint technological development project between universities and companies, Lehmann address the process-oriented facilitation of companies to innovate on the green agenda. In addition to the innovation perspective, academia is furthermore often directly involved as partner in respect to foster learning, gather experiences and disseminating the good examples (Etzkowitz 2008; Etzkowitz & Leydesdorff, 2000; Lehmann 2008).

The Carbon 20 project reassembles both Malmborg's use of PPP and especially Lehman's PPAP in its set-up where the municipalities, assisted by Aalborg University, attempt to influence the companies to take up the green agenda.

THE RELEVANCE OF DISCOURSES FOR THE GREEN GROWTH ACTIVITIES OF THE CARBON 20 MUNICIPALITIES

Above is presented recent development in discourses within several different academic discussions. These discussions are currently merging with several diverse overlaps, interconnections and interlinks in respect to the agenda of (local) public entities directing business development towards the societal grand challenges.

Departing from this merging of discourses, the remaining of this chapter address how the seven municipalities are commencing to combine several of these trends and ideas into local pragmatic policies to boost the local business development by meeting societal and municipal challenges.

In the beginning of this chapter it was highlighted that the discussions among the seven municipalities in the facilitated exchange of experiments on the green growth agenda could be catered in six topics that previously were rather distinct arenas covered by different regulatory frames – naming them thus sub-arenas.

1. Overall business strategy and policies
2. Direct business support – structure and organisation
3. One stop shop – smooth public service to companies
4. Promotion of green employment
5. Public procurement and tendering,
6. Public Private Partnership and innovation.

The point is that the above academic discussions and discourses have influenced both the different regulatory frames as well the municipal practises within and across these sub-arenas that are attempted to be combined with the focus on supporting local business development by addressing societal and municipal challenges – here climate change mitigating and environment.

The sub-arenas of 1) and 2) relate primarily to the discussions on public policies regarding business development. With inspiration from among other Porters cluster approach; this has in Denmark had a high regional dimension that is now partly distributed to the enlarged municipalities. In line with the altering in discourses, the municipal practises within these sub-arenas also links to the discussions on influencing the innovation dynamics – preliminary as overall target to motivate growth and entrepreneurship, but increasingly also the direction in terms of addressing e.g. green growth. The sub-arena 1) address the overall policy levels, that also links to the partnering concepts, whereas sub-arena 2) looks more

specifically at the municipalities' new responsibilities in the business support scheme

The sub-arenas 3) and 4) depart also from the discussions on policies for business development. Sub-arena 3) relates specifically to a typical pro-market policy of reducing administrative burdens of companies, whereas sub-arenas 4) relates to one of the prime arguments for growth in terms of job creation. The practises within both are however changing in response to the debate about reorienting the public sector administration beyond NPM as argued by Sørensen and Torfin (2011).

The sub-arena of 5) and 6) specifically relates to the presented discussion about a move from NPM concepts of outsourcing and privatisation and scale procurement towards new concepts of Shared Value and Public Private Partnership, including also the specific links to the recent discussion related to innovation dynamics and the public partners various options for affecting and engaging in the innovation processes.

In the remaining of this chapter, the six sub-arenas are each addressed in different subchapters. Each subchapter will begin with introducing the overall framework setting the boundaries of the municipal actions within the topic. A presentation of the general organisation of the topic in some of the municipalities are provided followed by analysing the specific practises in terms of experiences, discussions, key findings and recommendations from the project. The linkages to the above discourses are discussed throughout the subchapters, as well as addressed in the conclusion.

8.3. MUNICIPAL BUSINESS STRATEGIES

As mentioned, the reform resulted in several new tasks to the municipalities. The task and responsibilities were however rather scattered. Some tasks were given the municipalities, however as options rather than requirements. Other tasks needed increased cooperation among the municipalities within the same region, with the new entities of the Regions, as well as other stakeholders related to regional development policies. In order to coordinate this increased need for cooperation among the municipalities in respect to the region, Local Government Denmark (LGDK) has created five regional forums of the municipalities within each of the Region to collaborate with the regions on field of shared responsibilities named Kommunekontaktråd (KKR) (Municipal contact council). Business development is actually viewed as one of the most fragmented area after the reform in need of network management in a field with several strategies and actors among and thus both the region and the municipalities within the region (Sehedsted, 2010; Sehedsted and Lund, 2010; Sehedsted et. al, n.a.).

While this calls for high level of coordination and negotiations internally among the municipalities and with the Region and other stakeholders, e.g. universities and NGO, this agenda also highlight a need for an increased focus on strengthening the municipalities own strategic work in the field in order to form a foundation for the broader collaboration and coordination. Or as the vicedirector of Albertslund has put it:

> "We need to recognise that the altered conditions calls for a rethinking. Instead of each of the municipalities in greater Copenhagen compete in being attractive within the region; we need to cooperate to be attractive as a region. This implies however both that we work together in respect to create synergy and consistency between the different municipalities, but still that each of us takes up the challenge locally" (own translating of statements in meeting minutes from interview with Blume)

He further explained that, previously Albertslund focused on the local business sector had been rather neglected as accustomed to being attractive just because of the proximity to Copenhagen and good infrastructure. Albertslund used to conceive the main area of competition as the overall livelihood of the municipality. Focus was thus mainly on providing services to citizens – good kindergartens, schools etc. The global competition in terms of companies' localisation, the altered business structure in terms of less space needed for production companies and lately also the financial crisis have however revealed a need for addressing the business development more explicitly in terms of both attracting and facilitating new and existing companies (Albertslund 2013b).

Opposite to this, e.g. Herning as a more remote municipality in Jutland has had a strong focus on attracting and maintaining an attractive business sector for long – considered this as a core focus for the continued development of the municipality.

THE BUSINESS STRATEGIES OF THREE MUNICIPALITIES

Most Carbon 20 municipalities do today address business development in terms of attracting, maintaining and further support the local business sector, but in varying degree and with differences in focuses. Five of the municipalities have specifically formulated overall policies, strategies and/or actions plans in terms of presenting a coherent framework for the business development. In the following, focus is on three of those: Herning as case of having strong focus for long, and then the two "newcomers" of Allerød and Albertslund that have chosen to implement respectively a rather limited versus a comprehensive approach.

In 2007 Herning organisationally linked the business and city development under the same department and began to renew the business policy with the overall "vision" of: *"Creating a good and dynamic environment for growth and*

profitability of companies and citizens on a sustainable basis". In 2011 Herning together with the local business organisation developed a specific strategy for 2011-2014 emphasising that maintaining Herning as attractive for business is a common interest that need combined action and attention from both the municipality as well as the business organisation.

The strategy specifically state, that the *"municipality is and need continually to be an active player to proactively boost business development though networks, innovations and projects"* (Herning Kommune, 2011: 2). With the subtitle of *"here are all possibilities open"* the strategy emphasis that the municipality should do its outmost to help find solutions for solving any problems.

The strategy presents several initiatives with responsibilities shared among both the municipality and the business organisation. These initiatives are presented in three overall "tracks" in terms of sectorial focuses, crosscutting themes and networking initiatives.

In the sectorial track, three (broad) sectors are judge to be of special importance for Herning in terms of competences and potentials. "Climate, energy and food" is highlighted as one of three focus sectors, together with "Health care", as well as the "Experience economy".

As crosscutting issues, the strategy highlights: increased focus on innovation in companies and together in public-private cooperation; an upgrade of the workforce – both those in employment and unemployed – through enhancing education, continued education and job training; Secure proper infrastructure; and increased branding of Herning as a business hub.

The network track suggests establishing several different focused networks e.g. on the highlighted sectorial focuses, but also including networks that reach outside the municipality borders in terms of cooperating with neighbouring municipalities and keeping a global/international perspective that can benefit possible export (ibid).

The strategy clearly depart from a cluster strategy of furthering specific current strong sectors, but do also apply a global and international perspectives pointing at some of the elements advocated by Cook in respect to his extending of cluster to platform.

In contrast to Herning, Allerøds policy is less ambitious. Until recently Allerød did not – as one of few municipalities in Denmark – provide direct local business support.

A core element of the strategy – established while the Major of Allerød was chairing the group under the Local Government Regional Council on business

development – is to establish such local business support. Allerød suggest to team up with several other municipalities around Copenhagen to engage (pay) the specialised business support unit - Growth House - for the capital region, "Væksthus Hovedstaden", to provide direct general business service on behalf of the municipalities – not just the specialised business support.

The policy does set directions in terms of an overall aim of being "a business friendly municipality", where Allerød shall work to improve its authority task for the companies in terms of prober response time and service oriented mind-set. The policy further also calls for the municipalities to think in PPP possibilities in respect to own services. However, the strategy neither point at specific areas nor distribute responsibilities for exploring such possibilities. Finally, periodic (2-4 annual) business information meetings are suggested on various topics e.g. the municipalities' procurement, tendering and other projects (Allerød kommune, 2011b).

The policy does follow many of the focus area in a DKLG leaflet arguing for the value of having a local focus on business development. However, the policy is rather overall without specifying any focus and themes, neither the actual responsibilities for its implementation (Allerød Kommune, 2011b; KL, 2005).

Another newcomer in respect to an active business policy, Albertslund, has opposite followed Herning in making the business policies an important strategic element in the future development of the municipality. Based on a process of both consulting internally and externally in terms of inviting all companies to provide inputs, Albertslund in 2013 published a business strategy that was followed close after by an action plan that outline the specific initiatives and actions to be taking during the next couple of years (Albertslund Kommune, 2013a; 2013b).

Albertslund links the business strategy to the societal challenges in general and more specifically in respect to the agendas central for the municipality e.g. as basic provider of welfare services. Albertslund specifically calls for using the business development as base for finding new smart (and cheaper) solutions in the public sphere (Ibid) and thereby articulating what Sørensen and Torfin argued in respect to a move beyond NMP.

The municipality has committed to be a green city and to similar agreements – e.g. EU Covenant of mayors. Contributing to the green agenda is thereby seen as central element in the business strategy.

The strategy and action plan of Albertslund applies, like Herning, both strategic – as well as crosscutting "tracks" with network initiatives included within the latter. The strategic tracks are however not termed as sectorial focuses in respect to local strength (as in Herning), but as thematic focuses. By this distinction, Albertslund

emphasises that it is not specifically addressing businesses within specific important sectors, but potentially addressing these thematic focuses in the communication with all the local companies. These thematic focuses cover: "Green Growth", "Growth through new health and welfare solutions", and "upgrading of the workforce" (Albertslund Kommune, 2013a; 2013b).

To promote these, the municipality have established four crosscutting "tracks": increase and target the business support; foster increased innovation by companies also together with the municipality; increase focus on cooperation internationally; as well as increase branding (Albertslund Kommune, 2013a; 2013b).

With the strategy, Albertslund highlights that the municipality offers itself as a real world "living lab" in terms of partnering with private entities to test and develop new solutions (ibid).

LINKS TO THE GREEN AGENDA AND FINDINGS FROM WORKSHOPS

As seen from this presentation of the three municipalities business policies and strategies, both Herning and Albertslund point out special topics as central focuses of attention, where environment is included in both as core strategic topics. Herning emphasises the Clean tech sector, whereas Albertslund emphasises that the greening of companies is a topic they wish to address in their communication with all kinds of companies – not "just" in respect to attracting and supporting those in the clean tech area.

Opposite to both Herning and Albertslund, Allerød doesn't point out such focuses and thereby any special focus on environment. However, due to the Carbon 20 project, the environmental field seems in reality to be a focal business oriented activity in Allerød. The officers involved in Carbon 20 even jokes that they are the business unit of the municipality.

During the workshops on the Green Growth agenda, it was emphasised that it requires top political focus and priority if the municipalities want to set-up an active business policy and use it dynamically in respect to target specific challenges as e.g. Green Growth.

The municipalities were as mentioned provided extended responsibilities in relation to the reform. However, the responsibility is still rather fluffy and actually in some aspect more an option than an actual requirement. It is thus an area that doesn't necessarily have a strong focus of the municipalities, and thus might be viewed as additional costly in respect to financial constraints.

Local Government Denmark (LGDK) therefore in the 2005 leaflet strongly argues for the value of business development specifically and provides various inputs to how this can add value for the municipalities (KL, 2005).

One of the possibilities emphasised at the workshops in prolongation of the experiences of Albertslund and Herning was to specifically link it up to other central focus areas in the municipality and to make it a platform for working across traditional boundaries (AAU, 2013b).

8.4. THE MUNICIPALITIES' DIRECT BUSINESS SUPPORT

As mention the Municipalities has been assigned extended responsibilities within the Danish business support infrastructure – they are to be the primary entrance point in a "unified business support system".

Simultaneously with the administrative reform, the business support structure in Denmark was altered aiming at what was named a "unified business support system" with the municipalities as central actors. This "unified business support system" does however still operate with a two-level support structure – a task of offering companies some local preliminary general support, and a task of more targeted support offered by regional specialised Growth Houses (in Danish: Væksthuse).

In respect to the "preliminary general support", the municipalities is encouraged – not obliged – to provide local business support in respect to e.g. informing about the start-up and establishment of companies in the area, but also including activities directed at training and informing about e.g. innovation, use of new technologies, competences, which in principles could include cleaner technology etc. Such training and information dissemination should be overall guidance and not specific counselling and advices. It should furthermore be offered as a general service equally available for all interested and relevant companies and start-ups. In the reform, the local business support is, in spite of the voluntary character, viewed as the primary entrance point for the whole business support structure. If the start-ups and entrepreneurs are judged to have a growth potential, they should be directed further into the specialised support system offered by the Growth Houses, or private counselling (Iris Group, 2010; Økonomi & Indenrigsministeriet, 2010; 2012).

The naming of those units as Growth Houses underscores that their focus is growth potentials and entrepreneurship. The name thereby mark a change in focus to several of the earlier units focusing more generally on technological upgrading of SME – these were named Technological Innovation Centres (TICs) (Iris Group, 2010; Erhvervs- og Boligstyrelsen, 2002; Økonomi & Indenrigsministeriet, 2012). Relating this to the discussions of different discourses above, this can be interpret as

a step away from more cluster inspired approaches towards more pro-markets policies in terms of ease the entrance and thereby enlarge the market.

The Growth Houses are formally established as six independent units under a collaboration agreement of the municipalities within each of the five regions and one on Bornholm. Until 2011 they were however financed and steered by the state. In that period common concepts, web platform, guiding materials etc. were developed. From 2011, the finance and control were – in principal – assigned to the municipalities. The state has however agreed to continue the financing of them until 2016. The state has equally still also a significant voice in the yearly agreements setting the direction for the activities of specific growth houses. While in principle now steered collectively by the municipalities in the same region (equal forum as coordinating the cooperation with the region on the overall business development strategy and regional/EU funds – KKR), the six units should still been seen as central linkages towards the national levels as well as still provide a certain uniformity in services across the country. In the reference agreement for the Growth House in the capital region of 2012 this was framed as both a horizontal and vertical coordination of the "uniform business support system" (KKR Hovedstaden & Væksthus Hovedstadsregionen, 2012).

The main task of the Growth Houses is to provide guidance for entrepreneurs and SME with growth potentials. This include specific free of charge coaching/tutoring and sparring about growth strategies as well as topics such as financing, sales, marketing and export, strategy and management as well as innovation and product development.

In addition to this direct support to companies with growth ambitions and -potentials, the Growth Houses are often central partners and promoters of the various national support schemes as well as often operators on the regional growth strategies and their prioritisation of possible EU regional funding, etc. They have also options to engage as specific partners and drivers of projects within the field.

Below, the focus is on the municipalities' own general business support.

THE ORGANISATION OF THE LOCAL BUSINESS SUPPORT IN THE CARBON 20 MUNICIPALITIES

As already stated, the municipalities have had quite different tradition for their engagement in such business support strategies. The municipalities have also reacted differently on how they respond to these new responsibilities. Most of the Danish municipalities have chosen to cooperate with external partners rather than organise it internally.

Copenhagen has as one of few municipalities established a rather large internal unit (others include Aalborg, whereas e.g. Aarhus as second biggest municipal also rely on external supplier).

Oppositely, Allerød didn't, as mentioned, until recently provide any dedicated business support at all. Allerød has however now together with among others Ballerup and several of the other municipalities surrounding Copenhagen engaged the specialised business support unit of "Væksthus Hovedstaden" to also provide the overall support for companies within those municipalities.

Albertslund has together with several others of the suburb municipalities to the vest of Copenhagen (Vestegnen) instead of involving the Growth House established a joint organisation to provide this services.

Both Kolding and Herning has made a specific arrangement with the local business organisations to carry out the task utilising that these cities have a tradition for a much stronger local organisation of the business sector than often is the case for the companies in greater Copenhagen.

Similarly Næstved has recently established a new joint unit together with the local business organisation to be in charge of providing such support.

As mentioned, the municipalities were in 2011 provided the authority to more directly effect the directions of the specialised units. Differences have developed between the different Growth Houses following from the regional prioritises. It seems however still to be to early to judge how much the municipalities have managed to utilise their formal competences to affect and align the focuses of the Growth Houses.

LINKS TO THE GREEN AGENDA AND FINDINGS FROM WORKSHOPS

These differences in terms of how to organise the local business support provide various advantages and challenges in terms of using the business support as active departure for a strategic business development policy targeted at specific topics of interest across traditional boundaries – e.g. green growth.

Herning has utilised the close contact and interactions with the local business organisation to engage them actively in forming a joint overall strategy pointing out specific focus areas. Engaging the local business organisation(s) as those who provide such general business support and guidance to start-ups etc. do also provide a greater opportunity to establish network activities among newcomers and the established companies on specific areas and/or topics of concern such as mitigating climate change. Kolding e.g. specifically engaged Business Kolding in the Carbon 20 to combine the environmental oriented competences with the business oriented

know-how. In the beginning, there were tensions in terms of finding the proper division of responsibilities and tasks. However, they did manage to find some constellations bringing in both competences among others that business Kolding arranged several networks activities to disseminate the findings with a specific business perspective.

In contrast to the business sector in Herning, Kolding and Næstved, the business sectors around Copenhagen have not had the same tradition for a strong local organisation. Furthermore the companies do not necessarily pay that much attention to the specific municipalities boundaries in terms of which municipality they are specifically placed within (interview Blume).

The three municipalities Albertslund, Allerød and Ballerup have chosen to use external dedicated entities to carry out the task jointly for several municipalities.

The idea of joining with the neighbouring municipalities seems as an appropriate response, since the businesses around Copenhagen do not necessarily have the same affiliation to the specific municipality in terms of placed on one or the other side of a municipal border in greater Copenhagen. The idea behind joining forces is also to enlarge the potential pool of companies in need for such services justifying having a broader set of competences present. Distributing the task to "the specialised entities" as in Allerød and Ballerup is furthermore an attempt to enhance the uniformity of the overall business support. However, the proximity and relations to the specific municipality is reduced, as well as to any specific interests and special areas of concern – e.g. tailoring the services to address the green agenda specifically.

The municipalities can in principle collectively influence the focus of the Growth House both generally as "owner" in respect to the specialised support services, but also specifically through the contracting to provide the general business support locally.

As mentioned, the focus of the Growth Houses has been assigned to mainly target start-ups, entrepreneurship and growth companies, whereas previously, the Technological Innovation Centres (TIC) focussed on technological upgrading the existing SME. In late 90s, TIC began to address the environmental upgrading of SME e.g. promoting environmental management systems. The Growth Houses do not at present give special attention to improving the environmental performance of SMEs. The international and national focus on clean tech and green growth has triggered that several regional support schemes and thus also the Growth Houses do emphasise entrepreneurship and growth potentials in respect to clean tech – focussing however solely on the development and innovation of new green solutions, and not greening of own processes for existing companies. (Erhvervs- og

Boligstyrelsen 2002; Erhvervsfremmestyrelsen 1998; Erhvervsstyrelsen, n.d.-b; Lyngesen, 1995; kl, n.d.; startvaekst.dk n.d.)

While the specialised service do target clean tech to some extent as targeted supplement to the guidance in the entrepreneurship etc., the focus of the service that Growth House of the Capital region provides for Ballerup, Allerød and others do currently not target environment at all (startvaekst.dk n.d.).

Albertslund has as mention chosen to set up a new entity together with other neighbouring municipalities instead of involving The Growth House of the Capital Region. That choice can be interpret as an attempt to have tighter control in respect to adapt the services to specific objectives and needs of these specific municipalities. The intent of Albertslund as presented in their business strategy above is to use such interactions actively to get into dialogue with the companies on the targeted areas (health and welfare, environment and job creation/reemployment); and not solely target new companies and entrepreneurs, but also addressing the existing companies (Albertslund Kommune, 2013a; 2013b).

Setting up an internal unit allows Copenhagen to target areas of specific interest such as e.g. integration and social inclusion by addressing entrepreneurship among ethnical minorities and other disadvantaged/marginalised groups etc. Environmental areas have not been addressed specifically so far.

At one of the workshops, a participant from the Network for Sustainable Business Development North Denmark (NBE) was invited to present their approach. The network is quite similar to Carbon 20 in the municipality taking a lead to influence local companies to take action on the environmental field – beyond compliance. Equally to Carbon 20, the municipalities of Aalborg and Hjørring also cooperate with Aalborg University and EnergiNord (local energy utility) to provide suggestions ranking from energy savings to green innovations. In addition to being involved by primary the environmental units (as in the Carbon 20 project), the municipality of Aalborg has also involved the internal business support unit. The business units thus adds competences on the business perspectives in terms of: business opportunities, juridical aspect as well as financial knowledge of favourable loans etc. from financial institutes, but also the various support opportunities in the different national and regional support schemes including those specific on green topics.

At the workshops, a central recommendation was to strengthen such cooperation between the environmental officers and those involved in the direct business support in terms of bringing more diverse competences in play in the direct interactions with the companies – e.g. either through expanding the approach of the environmental officers to include encompasses competences and approaches

typically applied by the business units and vice versa and/or join forces when approaching the companies.

An additional recommendation was to collectively use the municipalities influence in respect to the specialised business support units of Growth Houses as well as the overall business development strategies of the region to target such topics conceived of relevance for the grand societal challenges such as environment and climate change – see also AAU (2013b).

8.5. SERVICE MINDED AUTHORITY – INTERNAL COOPERATION AND RESTRUCTURING

A central argument for the structural reform and the creation of bigger municipalities was the NPM understanding that this would provide better options for streamlining the administration – scale of "production". The reform was named "The new Denmark – a streamlined public sector close to the citizens". This potential streamlining of the reform were judge to uphold any initial costs of the reform, whereas the reform explicitly didn't allocate extra resources to implement the reform as the reform should be neutral in the short run. The reform furthermore introduced the concept of "one entrance point to the public sector" suggesting that the municipalities should establish "citizens service desk" in order to reduce the perceived bureaucracy of the public sector. For the business sector, the reform also implied a more uniform allocation of authority responsibility to the municipalities. The proposal for the reform argued specifically that the enlarged municipalities would have better options for providing a service minded and non-bureaucratic public service (Regeringen, 2004a; see also Bundsgaard and Vrangbæk 2007; Vrangbæk 2010).

The reform were thus also seen to add to the government's overall target to make it easier for businesses in Denmark: "*The Government intends to reduce the administrative burdens in the corporate sector, on an annual basis, so that by 2010 the reduction amounts to up to 25 per cent*" (The Danish Government, 2002: 47).

The federation of Danish Industry has followed up on this agenda by since 2009 publish a yearly benchmark of the local business environment of municipalities - "Local Business Climate Survey". One parameter is the service mind of the municipalities, measured e.g. by response time on decisions (DI, 2014a; 2014b).

The current government has also picked up on this agenda of reducing burdens of companies. In 2012 the Government e.g. launched a "business forum" to identify redundant rules that provide costs for businesses. This committee among others pointed out that few municipalities have followed the recommendations to establish central entrance points for businesses to facilitate such smooth business service - known as "one stop shop" (Virksomhedsforum for enklere regler, n.d.). The forum

argued that this lack imply that some companies have trouble navigating to whom or which unit to approach within the municipalities in respect to different cases, and even experiencing that the municipalities have difficulties in appointing them to the right place.

THE SITUATIONS IN THE CARBON 20 MUNICIPALITIES

Mirroring the national focus on reducing the administrative burdens on the companies, the Carbon 20 municipalities have also had attention to streamline their authority role in respect to the companies (and citizens) e.g. regarding approval of building and construction projects, environmental permit and -inspection, diverse licencing and permissions, etc. Several municipalities have set-up internal goals and indicators for response time on such authority decisions (e.g. Allerød, Copenhagen and Herning).

In addition to "just" improving the response time, the municipalities are also in the process of introducing a more service minded operation e.g. expressed by one officer in Herning in respect to the subtitle of the business strategy: *"We have been involved in this development of the strategy. During this process we have been taught that we instead of just say "no" on any negative authority judgement. We should instead say: "no, but…"* (Interview officer in Herning related to 2nd monitoring process) meaning that they also should provide an alternative suggestion for what is then possible.

Several municipalities have established procedures for an early start-up meeting related to applying for permits, big construction projects, etc. Several also call for a proactive dialogue with companies about future plans e.g. during the regular inspection activities or any other contact with the companies. This goes however both ways in terms of receiving early information about their plans and wishes, but also the opposite way to inform companies of any municipal plans and projects that could be of interest.

Some of the participating municipalities (e.g. Copenhagen, Albertslund and Næstved) have implemented – or are consider establishing – "one-stop-shop" entrance point or other internal actions to secure a more uniform and transparent interaction with the companies. This has triggered increased cooperation among different units within the municipalities and even administrative and organisational changes.

LINKS TO THE GREEN AGENDA AND FINDINGS FROM WORKSHOPS

In respect to the service oriented municipality, some building approval officers in Allerød did express concerns of more "unbiased" judgement given the increased

pressure on both response time and the political emphasis on the municipalities as business friendly (Officers in Allerød on the building approval).

Opposite, applying a more service-oriented operation might also provide possibilities for suggesting companies to go even further in a desired direction, e.g. green building certification.

In Albertlund's business strategy, the "authority role" is renamed to a business support activity – emphasising that the officers shall extend focus from "just" being the authority that check compliance with the rules. Instead, the business strategy highlights that the environmental officers shall engage in dialogue with the companies in terms of how to improve performance and/or make the desired changes in line with the frameworks etc. Exactly what the core of the Carbon 20 project has addressed in respect to the environmental regulation of companies in terms of facilitating to go beyond compliance (Albertslund 2013a; 2013b). Equally, based on the experiences from the sister project of NBE, the municipality of Aalborg is also in a process of enlarging the traditional compliance inspections of local pollutants towards addressing sustainability (see also chapter 6/paper 2 and Remmen et al., 2015).

The process of establishing Albertslund's new business strategy (2013a) and subsequent action plan (2013b) has contributed to increased internal cooperation among the various officers with contacts to companies. Already at the beginning of CARBON 20, the interviewed officer from Albertslund expressed that a political decision had been taken that all municipal officers in contact with companies in principle represent the municipality as a whole. Meaning that the single officers in various units in addition to the specific knowledge need to have an overall knowledge about the policies and agendas of the municipality.

On top of this decision, a local reorganisation of the administration has placed those in direct contact with the companies (primarily environmental monitoring and enforcement, as well as officers responsible for finding employment opportunities) in the same section and thus organisationally closer and referring to same director. Furthermore, an internal business coordination network was established with all employees having interactions with companies coordinated by a task force with representatives from each of the different units having interactions with companies. The aim is to enlarge the overall knowledge base on the companies and to coordinate any contact with these – including addressing them as potential partners in innovation projects. Furthermore, the business action plan launches the aim of establishing "business contacts point", where business can contact the municipality with any question whether related to need for aid in terms of business support, approvals etc. or whishes' to be partner in innovations projects etc. (Albertslund Kommune, 2013a; 2013b; see also AAU, 2013b).

In Copenhagen the internal unit for business support has been appointed the one-stop-shop in terms of the business entrance to the municipality, whether related to business support or the expertise of other units in terms of e.g. environmental permits. The business support unit thus guide such companies in question further in terms of whom to contact with various questions. The unit also provides the option to connect a specific contact person to the company in case of regular contact is expected. The purpose is to secure that the company is provided proper assistance to navigate between the different departments and units – this includes also the possibility to organise so-called "star meetings" involving all relevant units at the same time. The business unit was in 2012 moved to the Department of technical and environmental issues – and renamed Copenhagen Business Service. Most of the dialogue between the municipality and companies actually relate to this department, whereas the organisationally changes were an attempt to smooth cooperation in that respect (København Kommune 2012; 2013).

In Næstved, the municipality has in 2013 established a joint unit with the business organisation that similarly is going to functioning as a common entrance point - named a business service desk unit, mirroring the citizen service desk that can provide several services directly and further guide towards more administratively "heavy" authority units. Næstved has established this unit "externally" emphasising the business support as contrast to the authority role. The unit has among others the task to *"With point of departure in the specific needs, we guide companies trough the different units and teams of the municipality, where we act as coordinator and are guarantors of an easy and smooth processing* (Næstved Erhverv, n.a.). As part of this some employees – from the different units in contact with companies including several from especially the environmental units – have been appointed as contact persons and have certain portion of their time allocated to this new external unit.

8.6. LINKING OF BUSINESS SUPPORT, EMPLOYMENT AND LOCAL GREEN GROWTH

An important priority for the current Government has been to combat the unemployment rate after the financial crisis. The government has linked the employment agenda to green growth arguing that the needed investments for a green transition of e.g. the energy system provide new growth potentials and thus employment.

As already highlighted, Herning and Albertslund include employment as a focal point of the business development strategies, and Ballerup and Copenhagen do the same.

The structural reform also had implication on the municipalities' responsibilities related to unemployment. An explicit target was to make a more direct link between

the municipalities' re-employment activities and their expenses to public unemployment benefits (Regeringen 2004a). Before the reform, there was a split in responsibility in terms of reemployment activities for the different segments of unemployed citizens. The responsibilities of the municipalities were mainly those most remote from the job market. The reform altered this, so that the municipalities' was allocated responsibility for the whole group of the different unemployed segments, whereas specific local "jobcentres" was established in each of the municipalities. The reform also emphasized that the municipalities should have an active strategy to engage the local businesses to take trainees, interns or subsidized employment etc. implying a much more active dialogue with the local companies (Regeringen, 2004a).

THE JOBCENTRES OF THE CARBON 20 MUNICIPALITIES

All participating municipalities have a unit "jobcentre" that specifically deals with the unemployed.

The business action plan of Albertslund specifically target an enhanced company contact by the local "jobcentre" in respect to get a clear picture of the need and wishes of the companies in respect to skills of potential new employees, as well as to promote companies to hire new employees, take up trainees, etc. In line with this, the reorganisation in Albertslund specifically also moved this units from the section directed at citizens to the unit mainly focussed on "services" towards companies.

Both Albertslund and Herning calls for increased use of what they call "job-rotation", implying that while a company send employees at continued education, they can hire temps. They also advocate for an increased cooperation with local education entities in order to tailor-made both the general education and especially re-training courses towards the different needs of the companies.

Copenhagen has already some experiences with this. In addition to the already mentioned synergy to other public agendas, the business unit has also cooperated with the Copenhagen "jobcentre" in respect to target the large group of unemployed academic graduates – suddenly under the responsibility of the municipality. Building on top of a national scheme of subsidizing the employment of unemployed academics in SME with few of academic staff in advance – Videnspilot – Copenhagen has re-defined those as "growth academics" and matching them with companies that the business unit had knowledge of could gain advantages from this.

LINKS TO THE GREEN AGENDA AND FINDINGS FROM WORKSHOPS

Copenhagen municipality did during the Carbon 20 project – and directly linked to the increased cooperation between the environmental units and the business support units fostered by this one-stop-shop mentioned above – managed to get some

"Growth academics" matched with some of the Carbon 20 companies. While the "growth academic" has not necessarily been employed specifically in respect to the implementation of the energy saving projects, it has allowed the firms to release some resources and allocate them for the energy saving efforts.

In prolongation of these experiences, the municipality of Copenhagen is – as an element in the continuation of the Carbon 20 activities after Life+ – considering how to tailor-made these retraining of the unemployed, so that they become the ones to implement the green agenda. They further consider extending such tailor-made retraining to other unemployed segments than academics[41].

The officer of Allerød has actively been referring companies to the Jobcenter, when encountered companies complaining about time constraints as main challenge for lack of progress in implementing the highlighted savings. Inspired by among others the use of "growth academics" in Copenhagen, he has also taken some preliminary contacts internally with the Jobcentre in respect to establish something similar.

Allerød has already engaged "a trainee" (student employ) in the unit responsible for the Carbon 20 with the intention that the trainee after a period in the municipality should be used for facilitating implementation in the companies[42].

The prospects of such trainees getting a job afterwards seem promising, as it has been stressed that a qualified workforce within energy savings and energy efficiency is lacking - e.g. expressed in a news story from "Dansk Energi" d. 5/3 2014 (Tornbjerg, 2014).

The financial crisis in Denmark resulted in a sudden turndown of the building sector after decades of growth. This resulted in high unemployment among construction workers. A tax rebate was implemented on the use of craftsmen in order to provide incentives to get households to invest in building renovations. At first it was considered to link this specifically to energy upgrading of the house by only providing the tax rebate to improved energy performance. This was however dropped (judged too difficult to administrate).

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[41] In a Swedish context, Malmborg 2004 showed how a municipality as part of promotion of EMS for local companies engaged in re-educating unemployed into being able to facilitate the companies to implement an EMS. They then functioned as a kind of shared environmental employee between several different companies each actually contributing to pay part of the salary (Malmborg, 2004).

[42] Similar solutions have been applied in Denmark. During the 90s, several "Environmental networks" was established involved in the promoting of EMS procedures by the counties and municipal officers (www.key2green.dk). Some networks did in various periods have trainees "employed" that more specifically facilitated the implementation of the EMS.

Several municipalities did pick up on this agenda of using energy renovation of private households as a way to get (or keep) the local craftsmen employed. Kolding e.g. participated in a pioneering project linking employment of craftsmen to energy renovation – naming it "green business growth" www.groenerhvervsvaekst.dk/. The project included: re-educating the craftsmen into having broader energy knowledge, encouraged increased cooperation between the different craftsmen across disciplines, as well as promoted this scheme actively towards the citizens. Similar projects have since been carried out in several municipalities including other Carbon 20 municipalities.

Kolding is currently evaluating their engagement in both the Carbon 20 and the Green Growth project in terms of considering potential synergies – e.g. in terms of getting the re-educated craftsmen connected to SMEs in need for energy renovations.

8.7. MUNICIPAL PROCUREMENT AND TENDERING

In Denmark, public institutions purchase for around 290 billion DKR (Moderniseringsstyrelsen, n.d). The public sector thereby has a significant purchasing power to provide a clear market signals for more environmental friendly products and services. The Danish governments have had policies on Green Public Procurement since the 1990s.

Public procurement is in Denmark, like the rest of Europe, highly regulated by EU, which provides an overall framework for what kind of requirements are possible to include in tendering's and purchasing orders. The basic principals of the EU public procurement has traditionally been twofold in respect to: 1) counteract nepotism and secure a prober use of public spending; and 2) secure a fair competition on public tendering across Europe (European Commission, 2014d).

The commission has frequently clarified that green criteria can be addressed. The directive has successively been altered towards increased flexibility allowing more room to experiment and apply various forms of more open-ended tendering procedures. The latest directives of 2014 even emphasis to use public procurement and tendering actively as a policy tool to address diverse public concerns (CSR, innovation, etc.), while still also underscores the twofold original focuses (European Commission, 2014d).

In Denmark the debate on public procurement and tendering has emphasised the two original objectives of reducing costs and allowing for broader competition on public tendering. The state has lead a trend in terms of organising the tendering process in big units to reach scale volume and even in some fields made interdepartmental purchase agreement that each organisational unit need to comply with (the so called SKI). Equal to the internal streamlining argument of the

structural reform, the creating of larger municipal units was perceived to provide a stronger position in respect to scale procurement as well as better use of outsourcing and privatisation (Regeringen, 2004a; see also Bundgaard and Vrangbæk 2006; Greve 2006; Vrangbæk 2010).

Denmark has however also had focus on Green Public Procurement. Since the 90s, the Danish EPA have prepared several guidance documents on green public procurement and also specifically applied such criteria in the procurements of the state and also lobbied for that towards the municipalities. The latter include the forming of a panel for green public procurement now enlarged to be a forum on green procurement more broadly, as well as a partnership between Danish EPA and several Danish municipalities. Denmark has adhered into EU voluntary target of 50% green public procurement for specific product groups, and do already complies with this; overall for the covered product groups, but with some variations in the specific product groups (Miljøstyrelsen n.d.).

During the late 00s more focus and emphasis were put on the actual possibilities within the existing framework for entering into more flexible tendering processes in respect to an increased agenda of innovation (see next subsection). The traditional focus on costs and competition has in Denmark led to a general view that these possibilities are restricted and difficult to apply. Several guidance materials have been published to aid public engagement in e.g. contractual Public Private Partnership, negotiated procedures, pre-tendering negotiation etc. (e.g. KL and Udbudsportalen.dk, 2010).

As mentioned the new directives have significantly reduced the previous limitations and even instead emphasise to use public demand as a policy tool to promote additional societal values in addition to the focus on cost and fair competition (European Commission, 2014d)

In the governments recent strategy on intelligent public procurement and tendering – green procurement is emphasised as a core objective along with other societal challenges. The strategy also highlights the principles related to a more innovative approach: engage in pre-tendering dialogue for market surveying to pose ambitious criteria; increase the use of functionality criteria as well as total cost considerations in terms of also looking at operation costs (Regeringen, 2013g)

GREEN PUBLIC PROCUREMENT AND TENDERING AMONG THE CARBON 20 MUNICIPALITIES

All municipalities in the Carbon 20 project have policies and procedures for including green criteria in their procurement and tendering and some also commence to include social clauses and other societal considerations. There are

however quite some differences in respect to how systematically and ambitious the targets are formulated compared to the typical focus on the cheapest offer.

Equal to the national level, the focus has so far mainly been to implement overall criteria, and not to link procurement to local greening of the industry. Equally only limited efforts have tried to include an innovation perspective (see more in next section).

Several of the companies' reason for participating in Carbon 20 was actually an attempt to positioning themselves in respect to the municipalities' procurement and tendering. During the project it didn't succeed to establish procedure for how to manage such situations.

Green public procurement has not been addressed as a specific goal in the Green City cooperation among the seven municipalities, but several of the municipalities participate in other similar cooperation on that topic. Both Copenhagen and Herning is participating in the mentioned partnership with the Danish EPA. Kolding and Herning is participating in collaboration among 15 Danish municipalities to make joint tendering (KomUdbud). The latter is not centred on green procurement, but an attempt to provide even larger scale advantages. However, environmental criteria are to be integrated by the municipality in charge of making the combined tendering e.g. emphasising criteria of life cycle costs.

While green procurement is not a separate goal in the Green City cooperation, a sub-target is to increase the demand and supply of organic food – co-existing with a goal that a certain percentage of agricultural land should be grown ecological. None of the municipalities seems to link these sub-targets in terms of having local organic food linked directly to the supply to municipal institutions etc. Other municipalities such as e.g. Lejre do however attempt to make such linkages between the local produced food and the public procurement.

In addition to just set standard requirement according to the guidance materials, eco-labels etc. the workshop revealed that some municipalities did have limited experiences with the more flexible tendering procedure in respect to the environmental field. Kolding has e.g. participated in a EU supported project on promoting sustainable innovation through public procurement, SMART SPP (www.smart-spp.eu). Kolding specifically focused on LED. Prior to the tendering Kolding had a consultation period to survey the top performance technologies in respect to specifying the tendering criteria emphasising functionality and total cost related to e.g. the lifespan of the products (SMART SPP, n.a.).

More recently and in response to the openings in the new directive and the strategy of the government, Copenhagen adapted their purchasing and tendering policy (Københavns Kommune, n.a.; 2014). This policy still emphasise to increase the use

of overall purchasing agreements across the municipalities different units in order to minimise cost, but also emphasises to use the municipal purchasing power to drive the green, social and innovation agendas. In the strategy Copenhagen Municipality specifically highlight five issues of concern:

1. Efficiency: Copenhagen must streamline its procurement through focus on price, running costs, quality, organization and management
2. Ease of use: City of Copenhagen contracts must be user friendly and support the municipality's fulfilling of task
3. Social Responsibility and the Environment: Copenhagen will use its purchasing volume to promote a development of more environmentally sound and socially responsible procurement
4. Market Dialog: City of Copenhagen's purchases to boost growth and job creation through market dialogue
5. Innovation and Growth: Copenhagen must think innovatively and holistic in its procurement with an eye for the total costs (lifecycle cost), as well as the development of new and effective solutions (Københavns Kommune, 2014: 5).

FINDINGS FROM WORKSHOPS

The exchange of experiences revealed that the officers in spite of policies emphasising the inclusion of environmental criteria still considered such criteria as in conflict to the political (and administrative) pressure to reduce cost and pick the cheapest offer a – and sometimes not even evaluating such in respect to life cycle costs in terms of also considering the operating costs. In addition focus is increasingly also put on other social elements in respect to e.g. job creation, new apprenticeships/trainee etc. rather than the green agenda. It was thus emphasised, that it often is difficult to prioritize the green considerations in the procurement and tendering processes if not in line with the other priorities of cost reduction and job creation.

At the workshop it appeared, that the normal procurement procedure is that both procurement and tendering is conducted in a central purchasing department of the municipalities in terms of agreeing on some general terms that the single institutions should follow. The reason is both the conceived scale advantages (the argument that such should provide for cheaper and more favourable offers), but also as mean to keep track of the legal requirements that generally are judged to be significant and challenging.

The green criteria are generally added through the tendering process by the environmental units, and not internally by the procurement units. At the workshop it was highlighted that this often is done as add-on rather late in the process, and not

in the preliminary formulation of the criteria. Allerød municipality gave an example that sometimes the tendering material is distributed so late in the process that it is basically not possible to make any changes or add additional requirements.

In Kolding, they have organised the work differently. In contrast to most others, one of the employees from the purchasing department is assigned specific responsibilities for including environmental considerations and all procurement and tendering passes through this employee early in the process.

In Copenhagen's new strategy, they also specifically assign who has responsibility for securing the different elements of the strategy (Københavns Kommune, 2014)

At the meeting, several participant procurement officers expressed that the exchange of experience and knowledge sharing in a forum across both internal boundaries and municipalities had been very enlightening in terms of discussing the issues in a new way. Several procurement officers expressed that this business perspective was rather new, but brought valuable new perspectives.

Symptomatically, the earlier referred internal coordination in Albertslund between the administration units with relations to businesses did not include procurement – and this even in a municipality running several innovation projects on products to be implemented in the municipality (see below).

At the meeting some suggested to continue this collaboration with the agenda of making it a target in the Green City collaboration. Others did instead emphasise the possibility to joint the many national networks on the topic e.g. Forum for Sustainable Procurement and especially the Partnership for Public Green Procurement, where some of the municipalities already are members.

In the findings from the sessions, it was recommended to include procurement more directly in the internal coordination of the strategic communication with the companies.

8.8. MUNICIPAL PUBLIC PRIVATE PARTNERSHIP AND INNOVATION

Simultaneously with the administrative reform of establish bigger units to allow for increased use of outsourcing and privatisation, the government also attempted to lobby for increased use of private actors trough the concept of Public Private Partnership (PPP).

In 2004, the government published an action plan on Public Private Partnership as an alternative to both organising all services as public, and the traditional outsourcing and privatisation debate. Several guides have subsequently been

produced to outline the rules and possibilities (KL og Udbudsportalen.dk, 2010; Regeringen, 2004b). While it for the former government was an attempt to accelerate on the marketization debate, several of the municipalities view PPP in line with the innovation credo of Sørensen and Torfin (2011) as an instrument to make qualitative improvements simultaneously with the cost focus.

The current government has as mentioned picked up on this agenda and calls for an active public partnering with private sector to address societal challenges.

While the PPP and PPI have been high on the political agenda at least since 2004, the actual experiences with such constellations are rather limited in Denmark. Until recently there have only been a few PPP on health and welfare technologies, and even less PPP in terms of long run construction and servicing contracts. However several municipalities are beginning to be engaged in such projects with a total of 20 specific PPP in 2013 (Greve, 2014; Konkurrence- og Forbrugerstyrelsen, 2012; Kristensen, 2013; Pedersen, 2013).

The numbers of projects are increasing and extended into other fields e.g. related to the environment and especially energy, where the concept of Energy Servicing Companies (ESCO) has gained interest. Again the actual experiences with full ESCOs is rather limited especially compared to the attention it has received. However, the concept has been applied in softer versions to some extent (Jensen et al. 2013)

GREEN INNOVATION AND PUBLIC PRIVATE COOPERATION IN CARBON 20 MUNICIPALITIES

The point of departure of the Carbon 20 project application for EU Life+ specifically attempted to feed into these debates on public private partnership and innovations. Both PPP and innovation were highlighted several times in the application.

The basic PPP applied in the project resembled however more that of Malmborg (2004) and Lehmann (2008)’s PPAP in respect to network and voluntary agreements, rather than this contractual PPP in focus of especially governmental publications.

The innovation element, likewise, first and foremost concerned a specific task to facilitate some of the participating companies to engage in innovation projects, rather than entering into joint co-development projects between the municipalities and companies on topic of relevant for the municipal services.

In respect to Rennings' dichotomy of environmental policies having an effect on either (or both) the demand or (and) push mechanism, such public facilitation

programmes can actually be regarded as both. It all depends on the focus of the programmes, which actors are targeted, what is addressed in respect to the innovation processes etc.

- If focus is to facilitate and motivate companies to implement available solutions (either EMS or specific technical equipment) aiming at greening production processes and sites, such activities likely encourage companies to pose a demand for suitable solutions (demands pull).
- Opposite, if the facilitation programmes are more targeting the companies' inclusion of environmental criteria in their product, process or service development (e.g. promoting eco-design method, concepts and tools), it facilitates companies to push the development of more environmental sound solutions (tech push).

The basic of the carbon 20 has focussed on the first issue, while the innovation task move focus towards the latter.

The specific distinctions between when the specific policies related to effecting the technological push or market demand might be blurred in real life without any sharp distinction between such in the practitioners' interaction with the specific companies. In other words a fluent and successive (pragmatic and opportunistic) broadening – or interchanging – from the one to the other accommodating the specific needs and conditions of the companies.

The innovations projects of the Carbon 20 have covered a range of different topics from: Greener products, greener supply chains, altering of food menus and minimising of food waste, minimising transport, heat regenerating, behavioural change of customers as well as more efficient emptying of road drains (AAU 2013c).

The municipalities' involvement has diverted quite much in respect to the various projects covering elements of among others:

- Preliminary identification of potentials for and interests in participating in such innovation projects
- Arranging and conducting specific dissemination arrangements, workshops and specific courses for the companies on diverse topics including solar cells, energy management, Cradle2Cradle, transportation and food, etc.
- Bringing in new perspectives to the municipal planning and projects e.g. insight about employee commuting in the planning of public transport
- Functioning as mediator between various parties (including internally) facilitating a process of finding proper solutions and compromises between various interest: e.g. in relation to Greening of the business district; the

business afforestation in combination with municipal climate change adaptation project to prevent rainwater flooding.
- Engage as potential procurer of solution to test an innovation that could both lower CO_2 emission and the cost of the services that the company provides the municipality in relation to optimisation the emptying of road drains.

The majority of the innovation project focused at the municipalities' role in catalysing companies to address the climate agenda in own innovation project. Several of the projects did however also have a broader scope implying also changes internally for the municipality. One of the innovation projects did specifically feed into the procurement practice discussed in relation PPP and PPI, R&D procurement.

In addition to this latter innovation project, several of the municipalities did also have other such partnership cases to show during the facilitated exchange of experiences, but not derived specifically from the Carbon 20 project.

Næstved has e.g. entered an ESCO agreement with Siemens in respect to the renovation of the municipalities' own buildings (Maigaard, 2012), and Copenhagen recently entered an ESCO agreement with Schneider Electric to energy renovate 16.000 square meters in 5 properties (Lange, 2014). As presented the ESCO concepts resembles the concept of PPP in terms of longer contractual service contracts that specifically links the renovation of buildings to the saved running cost in terms of energy savings.

Herning has recently also entered into a PPP project with its supplier of clean working clothes enlarging focus from energy to resources. In prolongation of Herning involvement in a parallel project centred on facilitating companies to adopt the Cradle2Cradle agenda, Herning looked internally towards its rather high use of working clothes that often is discharged before actually worn-out. The partnership agreement with the supplier – a laundry service company supplying the clothes – attempts to find ways to either increase the reuse of the closes directly and subsidiary recycle the close. (Herning Kommune, 2013). Where the ESCO project often centres on the implementation of the already known available solutions, Herning does with this project moves towards emphasising the continued innovation and testing of new solutions during the contract.

Emphasising even more the co-creative and new development aspect, Albertslund have managed to carry out several PPI projects during the last couple of years related to especially the two areas of respectively LED outdoor lightning and renovation of public housing.

In 2007 Albertslund partnered up with DONG, DTU, Mads Odgård Design, Philips Lighting A/S and Arkitektfirmaet ark-unica to update a unique outdoor lamp from the 1960s, named the Albertslund lamp, with LED. The project was supported by a national scheme targeting energy savings (Albertslund Kommune, 2009).

Several of these lamps are now in use in city parks, pathways and squares and the partners have continued to further the project into looking at outdoor street lightening that integrate solar cells, windmills, ICT elements etc. The project has further inspired the creation of Danish Outdoor Lighting Lab – DOLL, where Albertslund provides the city as a living-lab test facility for new outdoor lighting solutions (Brix, 2013; Fribo, 2014; Løvholdt, 2013).

Similarly, Albertslund joined together with a range of partners in respect to an innovation project about standardised energy renovating and upgrading of old 1970s prototypical townhouses. Together with the partners (BO-VEST ("public" housing administrator), Danfoss, Rockwool, Velux, Kuben, Niras, Nova5 og Teknologisk Institut) they received funding from the mentioned national energy technology test and demonstration scheme (EUDP) to develop a real world testing of different options to easily energy renovate these through prefabricated solutions (Albertslund kommune, 2011; Albertslund-konceptet, n.d.). Based on these experiences Albertslund together with among other Copenhagen has received EU funding for a follow up project on energy renovation of buildings in general, Plan C http://www.plan-c.dk (Carlsen, 2013)

In prolongations, in parallel with, and as a manager of these projects, Albertslund has initiated Gate 21 as a partnership between local authorities, private companies and research institutions. The object is to innovate ambitious solutions to local authorities' climate and energy challenges through public-private projects. (http://www.gate21.dk/UK/). This public-private-academic partnership – or triple helix – is not centred on a contractual relationship, but rather as a joint entity based on membership. The main concept is that this entity shall function as platform for develop and seeking external funding for projects on innovating and testing new solutions that both have municipal application and private company growth potentials. Actually, Gate 21 has functioned as project management of the Carbon 20 project.

As seen, most of the seven municipalities do to different extent have some experiences with such broader cooperation and active use of procurement to target innovation of new solutions of relevant for the municipalities' task and services. However, this is still in its infantile compared to both the academic interest and the attention of the former and current government.

During the meeting, some challenges for such PPP and PPI were highlighted in respect to e.g. the pre-tendering involving of selected companies; perceiving it to

conflict with the (existing at that time) EU tendering procedure – both from the authorities side in terms of not to provide these companies advantages in final tendering; but opposite also from the companies side in terms of hesitating to get involved in fear that they will be excluded from the final tendering.

During the meeting it was highlighted that even under the former EU rules these perceived challenges were possible to address and that there exist several guidance documents from both the state on PPP and PPI as well as some from the mentioned Plan C project. One possibility is e.g. to split the process in an innovation project and a tendering process. As mentioned such possibilities are made more explicit and even a goal in the new EU framework.

A different challenges was that most often the unit often involved in these current innovation and partnership projects is an overall strategic and/or development units and not the unit responsible for purchasing and tendering.

Based on these experiences, the session on this issue recommend to expand and seek to use PPP and PPI actively to address innovation of better solutions, providing the municipality as living lab test facilities, as well as to involve (local) knowledge-, research and educational entities when relevant to make it a public-private-academic-partnering or triple helix.

8.9. CONCLUSIONS AND RECOMMENDATIONS

By exploring the emerging practice of the seven Danish Carbon 20 municipalities (local government) on the green growth agenda, this chapter has contributed to the various academic discourses about the public role in respect to regional and business development, innovations dynamics as well as public private collaborations and partnerships.

The chapter is contributing by adding a local government perspective to this new pragmatic matrix approach to public policies on business development and growth, and give some local flesh to the strategy of "picking the problems". The seven local municipalities have begun to develop an interactive and cooperative approach to the companies by engaging, encouraging, collaborating and entering into partnership with the local business sector.

The facilitated exchange of experiences revealed that the local green growth agenda cut across both diverse academic discourses as well as traditional local governmental boundaries and pillars; here framed as six sub-arenas of 1) Overall business strategy and policies; 2) Direct business support, 3) A service minded public service to companies, 4) Promotion of employment, 4) Public procurement and tendering, and 6) Public Private Partnership and innovation.

The practises of local authorities within these are however merging in respect to the green growth and business support agenda.

In the debate on public policies for business development and growth, there have traditionally been distinctions between "pro-business policies" of "picking the winners" contra more "pro-market policies" in terms of "Levelling the playing field". Both these positions are merged in a mixed policy approach that on the one hand adhere into the market driven principles of applying an open and transparent business support and growth policy framework, but at the same time also acknowledge that the public has an additional role to set the directions by e.g. highlighting societal challenges that need to be addressed as well as targeting the public innovations policies towards engaging the private sector to find solutions – A pragmatic matrix approach of "picking the problems".

This thinking is connecting the business and growth policies to the innovation debate, where, among others, the system and transition perspective on innovation has emphasised the significance of existing institutionalised structures and constellations of actors in forming specific technological development paths. The altering of such trajectories calls for active political and administrative engagement to allow new solutions to develop into valid alternatives to the dominating socio-technical regimes. Extending on the regional cluster and platform approaches to business development, the transition position argues that public policies should both influence the overall socio-economic landscape of the incitement structures, the actual institutional settings and regimes of the developments as well as encourage, nurturing, shielding and even engage in niche development. The local and regional policy level is especially central positioned for the latters.

Such policies can affect both technology push as well as market pull dynamics of the innovation systems in diverse ways ranging from indirect influencing the market incitements and signals trough altering in the regulatory framework, various funding and facilitation of the innovation processes, as well as specific lead market public demands and direct R&D engagement.

The latter point towards concepts of Shared Value and Public Private Partnerships that extend on the traditional NPM approaches to outsourcing and privatisation by maintaining a qualitative parameter for the renewal of the public sector.

This change is seen both globally by organisations such as UNEP and OECD, regionally by EU, nationally in Denmark, as well as some initial attempt locally by the municipalities. At all levels, an emphasis is put on using the Societal Grand Challenges including climate change and environment as central drivers out of the economic recession in terms of setting up political targets and regulations as well as direct the public innovations programmes towards finding solutions to such challenges.

In this chapter some of the initiatives of seven Danish municipalities has been exposed, but also that the opportunities are not fully utilised by all municipalities, whereas a stronger application imply some facilitation and learning across both internal units as well as between municipalities with focus on collaboration internally and externally e.g. business support system, local knowledge and educational institutions, as well as systematic linkages to academia and research.

The facilitated exchange of experiences revealed that several of the municipalities had taken up the green growth agenda as a central element in their newly adopted strategies and action plans to boost local business development and job creation taking the point of departure in the societal grand challenges. Likewise, several municipalities have or are currently in the process of an internal organisational restructuring that emphasises the new business perspective as a central focus area, e.g. linking specifically the officers occupied with job finding efforts and the officers involved in environmental permitting and inspection of companies; establishing job-training courses targeted specific prioritised sectors and areas such as energy and environmental improvements; as well as some attempting to make closer connections between these targets and the municipalities purchasing and tendering departments. These organisational changes can be seen as an attempt to streamline the organisation in order to improve the municipalities' capability to interact and collaborate with the private companies; symptomatically there seems however to be some neglecting of attaching the purchasing unit specifically in these processes.

Some of the objectives with the administrative reform in Denmark were based on the assumption that creating the larger municipalities would allow for increased efficiency, not least by allowing bigger purchasing orders and better options for use of private companies to perform the various services via outsourcing and privatisations. The facilitated exchange of experiences confirmed that this have been the main approach to public procurement. It did, however, also reveal that several municipalities did have several specific cases on how to use the Public Private Partnership and Innovation perspective to transgress the NPM perspective of outsourcing and privatisation. However, mainly orchestrated by different units than the actual procurement units.

Several of the municipalities have for long had policies in place for Green Public Procurement and thus been accustomed to set additional requirements to the strict economic criteria otherwise highly promoted earlier in Denmark. The municipalities further were beginning to add in different social clauses; especially in tender of big construction projects in respect to e.g. use of trainee etc. A move is emerging within the municipalities towards use of pre-tendering markets surveillance and the PPP, PPI and co-creating processes and offering the municipality as living lab for testing new solutions as base for mutual learning and cooperation across sectors including also to some extent university research in triple

helix or Public Private Academic Partnership (PPAP). However, this is still in its infantile and needs continuing focus and more projects in order to develop into specific regimes of practises, which go beyond the single projects.

Based on the many constructive discussions and input during this facilitated exchange of experiences as well as the experience of Carbon 20 project in general, some overall recommendations for how municipalities can organize and stimulate a local green growth in cooperation between businesses and the municipalities can be formulated:

1. Implement a business strategy that cuts across internal sectors in the municipality as well as reach out to networking and partnering with relevant companies and stakeholders hereunder universities and knowledge institutions, which in general seems to be underused
2. Use the future challenges of the municipality as point of departure for establishing a business strategy including commitments towards the climate and sustainability agenda
3. Apply the skills of (local) knowledge, research and educational institutions both in terms of (re) education, but also as partners in innovation projects
4. Offer the municipality as a Living Lab for companies, universities, etc. to test their latest products, technologies and research ideas
5. Networking and cooperation across the municipalities, both internally and externally
    a. Create an internal network across departments with both technical and environmental administration, business departments, job centres and procurement office, etc.
    b. Develop the inspection and other interactions with the companies to function as platform for promoting the municipality agenda e.g. green transition of local businesses. This implies increased coordination and internal mutual learning among e.g. the traditional environmental inspection role, business support role and officers focused on finding jobs for unemployed etc.
    c. Knowledge sharing across sectors and municipal boundaries – use of IT to make this SMART
6. Internal organization in relation to green, innovative procurement
    a. Exchange of experiences across municipalities including various units on green procurement and supply, PPP and PPI by joining the existing national networks like the Forum for Sustainable Procurement and Partnership for Green Public Procurement or establish a new network across the Green City municipalities

   b. Secure proper procedures and interactions among the different departments to secure that all relevant criteria are addressed in tendering
7. Create a common consensus and commitment in terms of sharing the good results, both internally and externally in the municipality in respect to get the politicians to get ownership to the environmental improvements and to let them tell the good stories
8. Act collectively together with the other municipalities in the region as well as the Region themselves to strive for an overall (business) development strategy that address green growth and other societal strategic challenges including also directing the business support services of the Growth Houses towards emphasising such aspects.

The recommendations are in general based on a variety of the actual organisation and context of the municipalities in Denmark. The specific choice of instruments, organisation, etc. depends on how the work in the municipality already is organized. What works in one municipality, does not necessarily work in others.

CHAPTER 9. COMPETENCE AND LEARNING OF THE MUNICIPAL OFFICER

In this chapter the task of the Carbon 20 project of enhancing the competences of the participating officers is addressed. The attention is thereby moved back to the horizontal interactions between the environmental officers in the municipalities and the companies with focus on the competences of the officers to address the specifics of the companies – the second element of the horizontal governance perspective.

In chapter 5 the first element was analysed in terms of the companies challenges for implementing energy savings highlighting that the challenges call for a flexible and adaptive approach of the officers. In the three last chapters, the regulatory frames, discourses and practises have been analysed within three different arenas, whereas the latter pointed at an emerging merging of otherwise rather distinct arenas.

This chapter picks up on this emerging merging of the arenas in respect to discuss what is the competences needed by the environmental officers to actually apply such flexible and adaptive approach pointed at in chapter 5.

The chapter is the first of two that address the municipalities' adaptation of practises within the merging arenas in respect to improve their governability to influence a change among the local companies to reduce their GHG emissions. Together, chapter 9 and 10 point at possibilities for the environmental officers to alter and adapt their facilitating practises in this new emerging merged arena. This chapter takes the first step by analysing what has been the actual learning of the officers during the project.

This chapter is also presented as a Paper that is submitted to *Journal of Cleaner Production* in March 2015. As mentioned some insights have in earlier version together with the earlier drafting on the findings from paper 1 and chapter 10 been presented at ERSCP 2013. Some earlier drafting of the findings is furthermore presented in numerous of the specific Carbon 20 documents.

9.1. PAPER 5: THE MUNICIPALITY AS A REFLECTIVE DIALOGUE PARTNER FOR ENERGY SAVINGS IN LOCAL COMPANIES

The municipality as a "reflective dialogue partner" for energy savings in local companies

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Abstract

Energy savings in the business sector are perceived effective to reduce Greenhouse Gas (GHG) emissions due to a gap of untapped potentials. Several policy programmes have aimed at closing this gap including programmes targeted small and medium seized enterprises (SME). Evaluation of some of these SME programmes have emphasised that SME needs close facilitation to implement possible solutions. This includes providing screenings free of charge, but further facilitation on the subsequent implementation.
The objective of this article is to provide inspiration for how to perform this latter facilitation of the implementation.
The article is based upon empirical data from a EU Life+ project in Denmark, Carbon 20. Seven Danish municipalities, a cross-municipal project entity, and Aalborg University carried out the Carbon 20 project during three years (2011-2013).
The municipalities engaged 120 SMEs to reduce their GHG emissions with 20% primarily through energy savings. The companies were offered energy screenings free of charge and an active facilitation by the municipalities during the subsequent implementation.
During the project a competence development programme were arranged to enhance the municipal officers' ability to engage and facilitate the companies. Based on the experiences during the project the concept of a "reflective dialogue partner" was introduced to capture the role of the officers in relation to influence a change among the SMEs.
The article is a presentation of that concept and discusses the experiences in the Carbon 20 project herewith.

Keywords: Energy Savings, GHG emissions, local authorities, "reflective dialogue partner", practitioners learning.

Highlights

- SMEs often needs assistant to achieve energy savings

- Policy programmes should offer SMEs preliminary screenings and facilitation on implementation
- The "reflective dialogue partner" is suggested as concept for municipal facilitation
- Municipal officers learning during the Carbon 20 project are discussed in light of that concept

1) Introduction

Energy savings by end-users are high on the political agenda internationally and in Denmark. The International Panel on Climate Change (IPCC) argued in its 4th report 2007 that energy savings in the industrial sector has huge untapped potentials for cost-efficient energy savings and GHG emission reduction due to various barriers that hamper the implementation of otherwise profitable solutions (IPCC, 2007) – referred to as a gap between profitable energy saving potentials and actual performance (Fleiter et al, 2012; Jaffe and Stavins, 1994; Paton, 2001; Sorrell et al., 2004; Thollander and Dotzauer, 2010).

This "energy efficiency gap" calls for political incentives to tap such potential. Paton (2001) has argued that policy driven voluntary agreements can play an important role for directing attention to the energy savings potentials (Paton, 2001). Lees (2012) has added that this especially applies for Small and Medium sized Enterprises (SME), who generally do not have the internal resources to prioritise aspects not considered as their core business (Lees, 2012; Thollander and Dotzauer, 2010).

Several political programmes targeting energy efficiency improvements in industries have been set-up. Thollander and Dotzauer (2010) point out that the majority of these programmes have been national and targeted the bigger companies. However, some local programmes targeting SMEs have been implemented as well - e.g. Bradford and Fraser (2008); Rohdin and Thollander (2006) as well as Thollander et al. (2007).

Both Bradford and Fraser (2008) and Thollander and Dotzauer (2010) stress that programmes targeting SMEs should provide an energy screening or audit free of charge. This is necessary in order to highlight that cost savings can be achieved and further present implementable solutions (Bradford and Fraser, 2008; Thollander and Dotzauer, 2010).

Thollander and Dotzauer (2010) further argue that this is not sufficient to get SME to implement the potential savings. An active facilitation of the implementation is also necessary (Thollander and Dotzauer, 2010).

Thollander and Dotzauer, however, provide limited attention to how to conduct such facilitation.

This has opposite been thoroughly discussed in relation to other programmes directed at facilitating specific changes among companies - e.g. programmes on facilitating implementation of environmental management systems (Malmborg, 2004) or health and safety improvements (Broberg and Hermund, 2004). This includes discussions of "change agents" as either: knowledge bank versus - broker; teacher vs. tutor; expert versus process consultant; or alternatively a "reflective political navigator" (Broberg and Hermund, 2004; Malmborg, 2004; 2007;).

The intention in the article is to bring some of this knowledge from other fields into play in respect to the municipalities as 2rd part "change agent" with respect to facilitation of energy savings by the companies. Focus is on the facilitation process to implement highlighted saving potentials, and less with the preliminary offering of specific energy screenings. For a closer discussion about the municipalities' experiences with cooperation with energy consultants to provide such screenings for SME see Dirckinck-Holmfeld (2012).

The article is based on empirical data and input from participation in a EU Life+ project, Carbon 20, LIFE09 ENV/DK/000366 (www.carbon20.dk/carbon20InEnglish/).

In this project, seven Danish municipalities have engaged 120 SMEs in reduction of their GHG emissions primarily by energy savings. The Carbon 20 project provided a framework for the municipalities' facilitation of the companies. This framework consisted of: an engagement process, offering screenings of possible options for energy savings free of charge, agreeing on relevant options for implementation and subsequent a facilitation process on the implementation. During the project, AAU introduced the concept of a "reflective dialogue partner" specifically in respect to this latter facilitation on the implementation (Carbon20, 2012).

In this article this term is explained as inspiration for how municipal officers, and maybe other 2nd part change agents, can address SMEs to motivate and facilitate them to reduce their energy consumption and GHG emissions.

In the next section the methodological approach is presented. Section 3 is an introduction to some existing literature in relation to facilitation of changes in companies drawing up some of the main conceptual inspiration for the introduction of the "reflective dialogue partner". In Section 4 the empirical background for introducing the concept is presented in terms of the discussions among the participating officers and researches from AAU leading to the development of the concept as a specific framing for how to influence the local

companies. Some preliminary insights into the officers applying of the term are also provided.

2) Methodology

This article is based on empirical data and information collected as part of the Carbon 20 project. The authors have taking active part in the project and the data used relates to qualitative inputs from the whole of this process.

Central for the topic of this article, the project included specific competence development activities designed to increase the municipal officers' ability to engage and facilitate the companies on this energy saving and GHG reduction agenda. The findings in the article are primarily based on the discussions following from these activities.

During the project some templates to provide guidance for the officers were prepared e.g. one on the facilitation of implementation of the participating business' climate action plans, which introduces the concept of "Reflective Dialogue Partner" (Carbon 20, 2012). In addition 3 monitoring reports have been produced based on among other interviews with the participating municipal officers. Insights from these also form contributions for the analysis of the experiences. Before the final monitoring (evaluation) report, the local officers were e.g. in a questionnaire asked open ended questions designed to make them reflect on their role in the interaction with the companies as well as their learning throughout the project.

Other reports have been produced as well: report on municipalities options for promoting green growth, report on some specific innovations processes carried out; report on the competence enhancement activities during the project; and finally the Layman report terminating the project (the latter also in English) (http://www.carbon20.dk/Publikationer/). The article also draws on the findings in those.

3) Conceptual inspiration

As outlined the objective of this article is to present and discuss the concept of municipal officers acting as a "reflective dialogue partner" in the attempt to influence SME to lower their energy consumption and GHG emissions.

Focus in this section is to discus the conceptual inspiration for the introduction of the term. The section includes a focused review of previous contributions on the role and approach for how to influence a change among companies. Preliminary the term "Reflexive" were used instead of "Reflective" in the Carbon 20 project. This section therefore also discusses the distinctions between these terms in relation to this topic.

The point of departure for this section is the evaluation by Thollander and Dotzauer (2010) of two similar local programmes in Sweden target reduction of energy use of SME (Rohdin and Thollander, 2006; Thollander et al, 2007). They emphasised that it has been crucial for these programmes to offer a screening free of charge or highly subsidised. They do further emphasise that such screenings has not been sufficient to secure proper implementation. They suggest that programmes targeted SME need to include an active follow-up and facilitation on the implementation of the highlighted savings to maintain focus among the companies. They do, however, not address how to conduct this facilitation (Thollander and Dotzauer, 2010).

This has nevertheless been thoroughly discussed in respect to programmes in other areas; e.g. in relation to Swedish municipalities different approach for facilitating the implementation of Environmental Management Systems in local companies (Malmborg, 2004; 2007); in relation to a Danish occupational health and safety (OHS) programme (Broberg and Hermund, 2004); as well as in the Danish debate on environmental regulation of companies (Dirckinck-Holmfeld, 2014).

Malmborg 2007 distinguished between what he framed as a "teacher" versus a "tutor"(Malmborg, 2007). In an earlier paper he calls it respective "knowledge bank" versus "knowledge broker", but apply similar meaning (Malmborg, 2004)

He apply the term "teacher" to capture an approach, where the local authorities "*holds and provides the main ideas about how a problem should be solved ... as well as most of the knowledge that is needed to make this happen*" (Malmborg, 2007: 1735f).

Opposite, as a "tutor", the local authority "*does not hold the specific knowledge needed in the companies and thus, does not engage operatively in the specific knowledge creation and transfer process.* [Instead, the authority] *acts to enable the ones that are in need of knowledge ... to get in contact with the actors that hold the relevant knowledge*" (Malmborg, 2007: 1735f).

In the context of Danish environmental regulators (including municipalities) interaction with companies, Nielsen et al. (1994) point out that the regulators should differentiate their approach according to the attitude and performance of the particular company in question. Nielsen et al (1994) framed this as a situated approach acting either as: a "police officer" enforcing requirement on the laggards, a "salesman" promoting the agenda for the more indifferent companies, and finally a "dialogue partner" for the frontrunners (Nielsen et. al, 1994). This has later in an official environmental inspection guideline been translated into a distinction between a "catalyst role" of promoting environmental improvement beyond compliance vs. an "authority role" of enforcing compliance (Christensen et. al, 2006).

Broberg and Hermund (2004) refers that the discussions about "change agents" have traditionally been based on a linear distinction between "an expert role" on the one end and "process consultant" on the other – resembling Malmborgs' distinction between a teacher versus tutor. They argue that this distinction is too narrow to capture the variety of competences that such change agents actually need. Instead they introduce the concept of a "political reflective navigator" to frame that change agents need to act within specific political settings, where they reflectively need to navigate their strategy and approach to align and match the experiences of the targeted companies (Broberg and Hermund, 2004).

The use of the term "reflective" in this context resembling among other Donald Schöns introduction of the Reflective Practitioner and Reflection-in-action as one, who reflect on and adjust own practices based on gained experiences (Schön, 1983). As such the concept draws on the pragmatic experimental learning philosophy of e.g. John Dewey and his concept of "learning by doing" and "reflective practice" (Dewey, 1938). Schön's concept further rests on his work with Argyris (1978). In this they introduce a distinction between double loops learning as something different from single loop learning. In single loop learning one keeps approaching the same problem without altering perception of that problem. Opposite in double loops learning one reflect on the underlying assumptions and norms for ones action and change accordingly (Argyris and Schön, 1978).

Cunliffe (2004) has attempted to enlarge Schöns concept of reflective practitioners to a "critically reflexive practitioner". He defines such: *Critically reflexive practice embraces subjective understandings of reality as a basis for thinking more critically about the impact of our assumptions, values, and actions on others* (Conliffe, 2004: 407).

The term reflexive refers to an interactive relationship between cause and effect and/or subject and object (self-reference). As such the term have had various applications in social science most notable "reflexive modernization" (Beck et. al, 1994), but also more specifically in respect to a change in regulatory approach e.g. Reflexive Regulation, Reflexive Law and Reflexive Governance (e.g. Hirsch, 2010; Remmen, 1997 and Voss and Kemp, 2005). A central aspect of must of these is that it implies self-critical reflections on the basic terms and concepts applied (Pollner, 1991).

Conliffe (2004) refers to Argyris and the distinctions between single loop and double loops learning in an attempt to clarify his use of "Critical Reflexive Practitioner" as something additional to the "Reflective Practitioner". He indicates that "the reflective practitioner" apply single loop learning in terms of "only" reflect on how to alter own actions within the given conceptual frames, whereas "the critical reflexive practitioner" applies a double loop learning in terms of also questioning the applied method and concepts (Conliffe, 2004).

As just referred, Schöns use of "the reflective practitioner" already draws on his work together with Argyris on single-loop/double loop leanings. The distinction between reflective vs. reflexive practitioner made by Conliffe may thus seem exaggerated as Schön also would argue that his "reflection" would encompasses the questioning the applied means and concepts.

With inspiration from especially Broberg and Hermund (2004)'s "reflective political navigator", the concept of a "reflective dialogue partner" was introduced during the Carbon 20 project as a specific framing of several discussions among and with the participating municipal officers on their role and the competences needed (see section 4) (Carbon 20, 2012).

In the Carbon 20 project the term "reflexive" (in Danish "Refleksiv" instead of "Reflekterende") was used preliminary in the guidance note introducing the term. For the final reporting of the project it were in the English version translated back to "reflective", while the Danish version still maintained the term reflexive (Carbon, 2012; Kelstrup & Munch-Pedersen, 2014a;b).

The use of the tem reflective (reflexive) in the Carbon 20 context relates preliminary to the officers' conscious reflections on own experiences and adaptation of practices. The framing of the term does not explicitly suggest the officers to question own applied concepts and understandings as such, but the whole concept of introducing the term during the competence development activities was an element to foster a collective reflexion on past applied understandings.

The note introducing the term emphasis to adjust approach and means in response to the targeted companies as they react differently on applied means. The note further suggests to challenges the immediate bounded rationality of the companies. As such the concept of "reflective dialogue partner" does imply a questioning of the existing understandings of and among the companies as well as be reflexive about how to approach different companies.

The objective of introducing the term in relation to the competence development activities has furthermore been to engage the local officers in a reflection of their own role as facilitating authority (or catalyst role) vs. their more traditional authority role. In other words, to learn how to become a "reflective dialogue partner" engaged in double loop learning as something different than their traditional outset in well-established Command-and-Control interactions. As such the concept is an attempt to make the officers reflexive about own past-applied concepts and understandings as well.

Aalborg University has facilitated the competence development activities and has challenged the preliminary understandings of the participating officers. The

"reflective dialogue partner" as concept is both an outcome of this process as well as a further framing for continuing a collectively critically reflexive reflection of the overall role and approach of the municipal officers (see later in section 4 below and the upcoming Ph.D. thesis of Dirckinck-Holmfeld).

Acknowledging the inspiration from Broberg and Hermund, reflective is used for the rest of this article.

Applying the latter term of "dialogue partner" instead of Schöns practitioner or Brobergs and Hermunds political navigator is making a direct reference to the earlier Danish discussions about applying a situated approaches in the environmental regulation of companies as presented by Nielsen et. al. (1994). The concept is thereby attempted familiarized for the targeted officers by including a wording previously used in respect to the Danish debate on regulatory approach in the environmental regulation of companies.

The understanding of Broberg and Hermund in relation to the political navigator is however still to be considered a central aspects of the term, whereas – as already indicated – the navigating of how (and who) to approach (in) the companies is very central (Carbon 20, 2012 – see section 4 below).

4) The Carbon 20 project and the introduction of "reflective dialogue partner"

The objective of this section is to present the Carbon 20 facilitation process, the preliminary approach of the participating officers, the specific competence development activities of the project, as well as the discussions leading up to the introduction of the concept of the officers acting as "reflective dialogue partner" and some overall finding on the application of the approach during the remaining one year of the project.

a) The Carbon 20 facilitation process

Carbon 20 was a three years EU Life+ project carried out by seven Danish municipalities and Aalborg University in the period 2011-2013. The main concept was that the seven municipalities entered a voluntary agreement with each of the 120 companies engaged. The companies committed (politically) themselves to strive for a 20% reduction of their greenhouse gas emissions.

As part of the agreement, the companies were offered an energy screening free of charge. In exchange, the companies committed themselves to work constructively together with the officers from the municipalities, consultants, universities and others to conduct an action plan aiming at a 20% reduction of GHG emissions. They further committed to participate in the municipalities follow-up visits on the implementation as well as monitor their emitted GHG during the three years

covering minimum their direct emissions and emissions derived from their use of energy – scope 1 and 2 GHG emissions cf. the Greenhouse Gas Protocol (WRI/WBCSD, 2004).

A main objective was also to enhance the competences of the participating officers from the municipalities to enable them to facilitate the companies to achieve GHG emission reductions. Supplementing their experiences from conducting the specific facilitation process for the 120 companies, several specific competence development activities were carried out during the project. The concept of the "reflective dialogue partner" was introduced on a competence workshop in mid/end 2012 specifically on the exchange of experiences for how to facilitate companies during the follow-up implementation process.

b) The participating municipal officers preliminary approach to fostering change

The reason for introducing the term, reflective dialogue partner, specifically for the Carbon 20 process was to challenge the participating officers preliminary understandings and ideas of their role in respect to influencing the companies.

The officers from the different municipalities had some variations in past experiences and thus different perspectives on how to influence companies to achieve energy savings and GHG emission reductions – resembling some of the above referred distinctions between the officers as either: knowledge brokers or – holder; teacher or tutor; experts vs. process consultants.

On the one end, several of the officers were accustomed to a rather narrow authority role of environmental permitting, inspecting and enforcing compliance. As mentioned the inspection could (or even should) in principal also include broader promotion of improvement beyond compliance cf. the concept of "salesman" and "dialogue partner" (Nielsen et al. 1994) and the later reformulation to "catalyst role" (Christensen et al. 2006). In spite of this, such broader approach has been rather neglected and also practiced limited among the municipal officers (see Dirckinck-Holmfeld, 2015; Remmen et al. 2015).

Several of the officers had thus a rather narrow command-and-control "dialogue" with the companies focussed around specific technical areas and within the boundaries of what were conceived as the legal foundation – the "police officers" using the wording of Nielsen et al. 1994. This interaction with companies is perceived as demanding specific detailed knowledge about both technical and juridical aspects in order to be on "secure ground", when formulating and enforcing requirements. Some did attempt to inform companies about EMS and other similar schemes to go beyond compliance, but mostly centred on providing information on such without specifically engaging themselves in this – element of the "salesman" using the wording of Nielsen et al. 1994 (Dirckinck-Holmfeld, 2015).

In respect to the competence development activities several of the officer therefore called for activities to enhance their technical knowledge about energy saving options judging that such insight would form a needed platform for the dialogue with companies – judging that it is important that they can bring such information into the dialogue with companies to be conceived as a serious and valuable partner for the companies – or as it were formulated *"to have something of value to "sell" to the companies"*.

Contrary to this, the officers participating from the largest of the municipality had for decades solely focused on promoting voluntary efforts. The municipality did in the early 2000s split the environmental dialogue with companies into two different units: one focused solely on the regulation – authority role; and one focussing solely on the voluntary efforts to go beyond compliance – the catalytic role – calling the latter Green Business.

The involved officers from this municipality were all from this Green Business unit. They were moreover in the process of altering approach from a direct facilitation of single companies, towards a twofold strategy of: 1) altering focus towards facilitate companies with clean-tech solutions to address those in need of solutions; and 2) increased promotion and exposition of the good examples.

These officers were thus accustomed to focus more on processes and the overall formation of suitable constellations of different other actors and not so much on the actual technical improvement options and the specific context of the single companies. They also stressed that the technical knowledge is appropriately available among other actors, whereas the challenge is to bring such into action for the specific companies in question. They stressed that this is especially challenging in respect to SMEs as the economic potential and capability among the SME is judged relatively unfavourable compared to larger companies (see also Dirckinck-Holmfeld (2012) for more insight into this attempting to get energy consultant to address SME, and the mentioned upcoming PhD for more insight into specific challenges for implementing savings encountered by the SME during the Carbon 20 project).

The officers from especially this municipality therefore called for competence activities focussed on improving their networking skills in terms of spot and facilitate the establishment proper constellation of actors that enables to bring the existing knowledge into play for SMEs.

c) The competence development activities of the Carbon 20 project

As highlighted above two central wishes for the competence development activities were pronounced in terms of respectively: enhances the more technical insight of energy savings to become expert or knowledge holder, vs. enhance the knowledge

broker and process consultant role of networking to establish and promote different suitable constellations of actors. As an attempt to accommodate those different wishes it were decided to include diverse competence activities.

Quite early in the project, it was emphasised that the competence element should be interpret as an essential and integrated element of the whole project and not solely in respect to the specific sessions addressing this. It were commonly acknowledged that the specific competence sessions could be valuable as forums for teaching or/and tutoring about varies topics, but also that the real learning involves a reflection about the practical experiences gained trough the direct interactions with the companies and other activities of the project.

The first specific sessions were devoted to overall introducing energy saving principles and to some of the most common technical solutions. In line with the above emphasis on the practical insight, it were further emphasised that the officers should prioritise to participate during the consultants' energy screenings of companies and thereby get more hands on experiences of the possible solutions. Several officers did participate at several of these screenings and also emphasised, that this has been very instructive.

Continuing this approach, the later competence sessions have been following a double focus. The sessions did continue to introduce various broader relevant topics such as presentations of available toolboxes for companies, employee involvement, lesson learned from specific innovation projects etc. A substantial part was, however, devoted as platform to exchange – and collectively reflect on the gained – experiences from the officers' different interactions with the companies. On several occasions, the officers were asked to reflect on - and present for their colleagues – what they have learned in respect to: successes, challenges and constrains as well as their own role.

As shown above, the Carbon 20 competence development of the municipal employees has followed three tracks (Carbon 20, 2014):

1. Competence development within methodological, technical and managerial areas channelled through so-called competence days with speakers from municipalities, universities and external advisors from e.g. energy consultants.
2. Knowledge sharing between the municipalities in a facilitated process – also at some of the competence-days, but also project meetings and working group meetings on specific areas (including transport)
3. Competence development through participation in on-the-job training – e.g. that the municipal officers participate in the energy consultants screenings of the participant local companies.

d) The municipal officers as a "reflective dialogue partner"

As an outcome of the discussions on the competence workshops and meetings during the project, a mediated common understanding between the preliminary approaches has been developed emphasising that the targeted companies are different in terms of what triggers them, their actual situation and the context for their business as well as the encountered challenges. The specific facilitation appropriate for the particular company in question are thus deviating depending on the specific context and situation of that company (see e.g. Dirckinck-Holmfeld (unpublished) for an analyses of the variations of the challenges encountered).

The officers thus need a combination of several competences to bring into play depending on the specific situation. On one end, they should have basic insights into the technical areas in terms of identifying overall potentials and focus areas in order to demonstrate the possibilities for the companies – be the salesmen able of convince and engage the companies. At the same time they should know where to direct the companies for more specific guidance in the various areas and even have made some possible predefined constellations enabling them to easily provide an attractive "packet" of screening etc. This involves networking and creative skills in terms of spot and facilitates creation of a suitable business case. Furthermore, the officers should also be able to show interest in the situations of the companies and the experienced challenges in order to align their agendas in respect to sell energy savings etc. as interesting for the various companies and maybe even engage in discussing business perspectives in addressing climate change more strategically.

The introduction of the "reflective dialogue partner" is an attempt to formulate this into a common understanding of the role of the officers as a promoter of change in respect to energy savings and GHG remission reductions.

The guideline introducing the concept (Carbon 20, 2012), defines the skills that such "reflective dialogue partner" should possess and further develop as consisting of four elements:

I. Understanding the specific terms of the companies' interest and actions on climate change as interlinked with history, external conditions, strategies and resources of the company, etc.
II. Assess who are the critical internal and external stakeholders in relation to the company, how do they influence the company's climate actions, and what different interests and values trigger them
III. Assess the possible interlinks and correlations between climate measures and other objectives of the company e.g. economy, quality, environment, occupational health, etc. This requires the ability to "translate" and communicate between different professional areas, concepts and values
IV. Navigate according to the findings in terms of who to get involved according to their interests, competences and influence in respect to the

climate change agenda as well as aligning approach and toolbox accordingly

Throughout the project various evaluations of the competence activities were conducted as input for the continued preparation of the following competence days. These generally showed that the officers were mostly satisfied with the content of the competence development activities and the majority did emphasise that the topics had mostly been relevant and added insight.

The mentioned difference of opinion related to the needed skills were, however, also apparent in those evaluations with different weight given to which of the specific training elements had been relevant and useful. Some would have preferred even more technical insight while others called for more emphasis on managerial and methodological skills.

Most of the officers expressed great value of participation in on-the-job training, such as touring some of the participating companies together with the energy consultant. They emphasised that this hands-on practice into has added great insight.

Similarly there generally seemed to be a high satisfaction with the various facilitated exchanges of knowledge and experiences attempted to create a link into this practical "learning by doing", or learning by practice, by getting the officers to engage in mutual learning by presenting discussing their experiences with colleagues having done tings differently.

The introduction of the "reflective dialogue partner" was accompanied with specific questions to introduce in the dialogue with the companies to make the officers reflect on the companies encountered challenges and how to address such – but thereby also to make the officers reflect on their own practice.

These question were as mentioned followed up in the qualitative interviews of the second monitoring process as well as addressed specifically in the final qualitative questionnaire. These latter had the double (or triple) aim of both collecting data for the monitoring process (and the research agenda), but also explicitly to make the officers reflect on the process – foster them to engage in double loop reflexive learning.

The questions asked in this final questionnaire were qualitative. The responses provided by the municipal officers deviated significantly in how detailed they have answered the questions. It has therefore been judged irrelevant to attempt to make any specific quantification on the responses.

The overall impression from reading these answers is that the officers express that their competences has been enhanced during the project and the different activities and discussions. Most of them also state that the experiences in general will be carried on in some way or another e.g. in relation to the inspection activities. As e.g. one of the officers expresses:

> The officers involved have obtained a lot of knowledge on opportunities for energy savings. Especially participating during the consultants' energy screenings and subsequent dialogue has provided a good way to enhance competences. … The obtained skills can be used in subsequent interactions with companies.

One of the officers from another municipality is more specific on how to use the experiences in the future:

Experience from the project, and the achieved results will be included in the municipality's future climate work. We plan to keep close contact and follow op on the performance of the participating companies e.g. during inspections. The experiences will also be used to strengthen the relations with other companies in the municipality e.g. by disseminating the lessons learned to companies that are subject to inspections. … The inspection employee are now prepared to guide and help enterprises reduce CO_2 emissions … In addition, the experience can be used in climate and environmental campaigns for companies not subject for inspection such as retailers, and smaller production companies.

One of the other officers original strongly emphasising the knowledge holder positions put emphasis on the more open dialogue between the municipal and companies:

> Generally, I have been very pleasantly surprised how well the companies have responded on this agenda. … It seemingly provides credibility that we as municipal do not attempt to sell them any specific solutions. … The relationship to most of the companies has increased. I judge that it adds to enter into dialogue with the companies on their challenges. … It is important to respect that the daily operation has priority for the companies, whereas they actually help the municipality reach its goals. … The learning achieved during the project about having a dialogue with the companies without the need of specific backing in the legal paragraphs is very valuable, especially as we have plans to continue this work in the municipality

A few specifically refers to the concept of the "reflective dialogue partner" and states that elements will be attempted integrated into their normal day-to-day interactions with companies – e.g. during inspection activities. Here expressed by the local officer in charge in one of the municipalities:

> The municipality has recently committed itself to the EU Covenant of Mayors, and the Carbon 20 cooperation model would be obvious to apply to continue an active dialogue with companies as element to reach these targets… We are specifically currently assessing how to adapt elements of the concept of "reflective dialogue partner" into specific application during the environmental inspection activities.

5) Conclusions

Energy savings in businesses are generally perceived as an effective way to cut GHG emissions due to unrealised potentials for improvements – in the academic literature termed as an energy efficiency gap. Several different policy tools have been applied to close this gap including local political programmes aiming at influencing a change among the local companies.

Earlier evaluations of such programmes targeted at SMEs have specifically emphasised that such programmes should include an upfront screening highlighting potential savings, but further that an active facilitation of the implementation is also necessary. While the need for facilitation has been highlighted, less attention has been given to discuss what this facilitation requires.

This has, however, been thoroughly discussed in other fields e.g. in respect to discussions about change agents as either experts telling what change are needed or process consultants guiding the targeted companies towards the desired change. Broberg and Hermund have introduced the concept that change agents should act as "reflective political navigator" as an alternative to the traditional change agent discussions. They emphasize that the "political reflective navigator" should possesses a variety of skills not properly captured through the traditional linear distinction between experts versus process consultants.

In this article, this knowledge is brought into the discussions of how to facilitate the implementation of energy savings and GHG emission reductions in companies based on the competence development activities during a specific local programme carried out by seven Danish municipalities.

The participating officers from these seven municipalities entered the project with some different past experiences and understandings about the role resembling some of the literature distinctions between expert versus process consultants, knowledge holder versus knowledge broker and teacher versus tutor. The competence development activities in the project were arranged to adaptively accommodate these different wishes for what skills to focus on, but also to challenge such preliminary perceptions of the needed skills. It was further decided to use the competence development sessions as platforms for continued joint reflexive reflections on the different gained experiences and practices during the project.

The Carbon 20 competence development activities followed three tracks:

1) Competence development within methodological, technical and managerial areas channelled through so-called competence days with speakers from municipalities, universities and external advisors from e.g. energy consultants.
2) Knowledge sharing between the municipalities in a facilitated process – also at some of the competence-days, but also project meetings and working group meetings on specific areas (including transport)
3) Competence development through participation in on-the-job training – e.g. that the municipal officers participate in the energy consultants screenings of the participant local companies.

As response to the various discussions of the role and needed skills and competences of the municipal officers the concept of a "reflective dialogue partner" were introduced as framing for taking these discussions further. Inspired by Broberg and Hermunds concept of "reflective political navigator", the "reflective dialogue partner" was seen as one capable of adjusting strategy and approach to fit the interest and mentality of the company in question. This means that the officers need to: possess basic knowledge and insight into available (technical) solutions, be able to spot overall gaps in current local energy performance, be able to listen and understand the situation of the company in question, and know where to direct the company for the available solutions. The latter also involve capabilities to spot and facilitate the establishment of suitable constellations that are attractive for different SMEs.

The municipal officers highlight that the project in general have contributed to enhance the competences to engage and influence companies on the energy and climate agenda. Several do point at elements included in the concept of "reflective dialogue partner" as important without referring specifically to this term, while however some also specifically makes references to this concept and emphasize that this approach will applied in the day-to-day interaction with companies e.g. during inspection activities.

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CHAPTER 10. ADAPTATION OF MUNICIPAL PRACTISES ACROSS THE THREE ARENAS

This chapter picks up on all the previous chapters forming part B of the PhD thesis.

The chapter furthers last chapter's discussions of the learning of the officers in respect to more specifically assess with of the various possible means and governing techniques available across the different governmental arenas are suitable for addressing the specific types of business challenges for implementing GHG emission reductions encountered during the project.

The chapters thereby provide a second step into presenting suggestions for how the municipality officers can adapt their practises within an emerging merging of the different governmental arenas to more properly align the complexity of the system to be governed.

The chapter combines the insight from all the previous 5 chapters (element) into an assessment of how the municipal officers acting as a reflective dialogue partner (chapter 9) can facilitate the companies to address (and potential overcome) the challenges encountered during the Carbon 20 project (chapter 5) utilising whatever suitable means and governing techniques available across the different arenas (chapter 6, 7 and 8).

This chapter thereby draws some preliminary conclusions on the overall research question. Focus is on the level of the officers' and how they specifically can influence a change among the local companies. These preliminary conclusions are in chapter 12 taken up on the broader municipal level in term of presenting a conceptual model of different components to include in and municipal strategy to influence companies' reduction of GHG emission.

This chapter commence by an overall discussion of potential means and governing techniques to activate in respect to the various challenges highlighted in chapter 5. The chapter continue, in separate subsections to elaborate on how to apply these means and governing techniques. Each of these subsections is based on the insight from all the previous chapters and further supplemented with other insights and knowledge obtained during the course of the Carbon 20 project and this PhD process.

10.1. GOVERNING MEANS TO ADRESS THE BUSINESS CHALLENGES FOR ENERGY SAVINGS

In chapter 5, it was analysed, which challenges that the companies participating in Carbon 20 had encountered during the project. The challenges were first grouped into six overall categories, but further diversified as the categorisation did not catch the actual variety of the qualitative statements pointing at quite some different situations; not least in respect to how the officers can facilitate companies to address such.

This subsection is a discussion of, which means and governing techniques can be used to foster companies to address the different encountered challenges.

Table 3 below recap the challenges highlighted in chapter 5 in respect to the diversity of the challenges under the overall established categorisation (see table 3 in paper 1).

Table 3 – Challenges encountered by companies during the Carbon 20 project (Own production, paper 1/chapter 5).

Groups of companies	*Groups of companies*
1) Lack of time / prioritisation	**5) Rules and legislation**
a) Motivated, but lack behind schedule	a) Levies excess heat
b) Lack of priority from management	b) Conservations rules
c) Hampered by more urgent issues	
d) Lack of commitment and motivation	**6) Insecurity about new technology.**
2) Lack capabilities	**7) Other challenges**
a) Knowledge on specific solutions	a) Part of branch or larger group
b) Skills to implement the savings	b) Dependent on 2nd parties
	c) Have realised most easy savings
3) Economic challenges	d) Are moving locality
1) Struggling for survival	e) Conflict other aspect (HQS)
2) Internal profitability of investment	f) Employee involvement
3) Difficulty raising finance and capital	
	8) Highlighted no challenges
4) Landlord and tenants	**No responses**
a) Split incentives – tenants	
b) Split incentives – landlords	
c) Temporalities of the rental	
d) The municipality as landlord	

The diversification of the challenges under the established overall categories was as mentioned specifically related to differences in how to facilitate companies to address them. This assessment of appropriate means to address the encountered challenges was therefore attempted structured according to this diversified categorisation of the challenges. The processing of appropriate means for addressing the various challenges revealed however that some of the means actually cut across these overall categories so that some specific governing techniques and

means are suitable for addressing several different subcategories across the overall categories.

Below follows therefore a highlighting of which means are found suitable to address which of the subcategories of Table 3. The further assessment of the means in this chapter follows the outcome of this highlighting of the different means.

For several of the companies it was highlighted, that no challenges had been encountered and/or that the company were well on track with the implementation (Category nr. 8 in Table 3). These companies can manage implementation themselves and as such don't need additional motivation and/or facilitation. Many of the statements related to lack of time and priority, did also cover situations were the companies principally could manage themselves as the "insufficient implementation" mainly related to own high ambitions (category 1a in Table 3). The companies were still very content with the participating in the project. The municipalities could therefore use such successful processes as a base for continuing the cooperation in terms of e.g.: engaging such companies as role models in terms of disseminating their experiences to others; and/or exploring opportunities for expanding the focus and efforts further e.g.: broadening focus to other environmental (or CSR) concerns, integrate climate agenda in business strategy and product development etc. or/and even cooperate to finding solution on specific societal challenges. Such further cooperation could also be relevant for the companies having realised most of the low hanging fruits (category nr 7c in Table 3). This is further elaborated below in subsection A.

For the majority of the companies, the encountered challenges related to either or both "lack of time" and/or "economic challenges". Several of these challenges relates to prioritisation of the task in respect to other tasks (some aspect of challenges under categories 1a, 1b, 1c, 1d and 3b as well as potential 3a in Table 3). The municipalities have attempted varies means to increase the incitement for such companies to prioritise the task ranging from simple follow up on the agreements to more firm authority means. These are each discussed in own subsections covering different governing modes (means and techniques):

- Active follow up on deadlines and encouraging to present results (subsection B)
- Provide possibilities for increased publicity as an active incitement (subsection C)
- Agitate for the additional advantages other than "just" the cost-reductions (subsection D)
- Use Public procurement actively as possible incitement (subsection E)
- Use More firm authority means (subsection F)

For some companies, it was however not as such lack of incitement, but specifically lack of time due to other urgent agendas (e.g. category 1c in Table 3). In addition to attempting to provide additional incitements, the officers have also attempted to provide more specific help to overcome such time constraint e.g. agitating for hiring additional staff or take in trainee – potentially even subsidised. This is elaborated in subsection G.

While the incitement and potential additional workforce for some may prove decisive, the challenges of several of the smallest companies to find the needed capital and problems lending money (category 3c in Table 3) is not eased by such. The Carbon 20 project has not as such succeeded to addressed such challenges specifically. There were some discussions on the topics during the project, and other actors are also beginning to address this by offering different financial solutions. Subsection H presents a discussion of some of these insights.

A few companies still had difficulties to implement the highlighted challenges in spite of the provided screenings. The different officers attempted varied means to address this. In contrast to the highly debated challenges of the skills to manage the implementation, most of the statements related more to specific knowledge gaps as well as concern in respect to whether suggested solution is appropriate (e.g. challenges related to category 2a, but also category 6 and 7f in Table 3). In relation to such knowledge and technical issues an officer from Allerød keeps a mental reference list of the good examples and who provide suitable solutions to expose for the companies. This could be elaborated more in terms of keeping more formal track of which participating companies have implemented what solutions and who have been delivered counselling/equipment etc.

The screenings were as mentioned provided companies for free. The project did however actually pay for some of the screening for the smallest companies as conceived that the cost of highlighting such would outweigh the gains in respect to potential savings to report for the EEO scheme (see chapter 7/paper 3). During the Carbon 20 project it were therefor discussed how to adjust the screening and/or establish some other arrangement suitable for such smaller companies. These discussion furthermore also attempted to address how to adapt the provided services to tackle the challenges related to lack of skills to implement as well as lack of capital for the investment (Categories 2b and 3c in Table 3). The adaption of screening and the collaboration with the energy consultants is taking up in subsection I. Subsection J elaborate further on this in respect to present possible constellations of other actors.

During the project, the split incentives between landlord and tenants were highlighted as the challenge encountered the third most. While it seems difficult to address some aspect of this in relation e.g. to the temporalities of the rentals (Challenges 4c in Table 3), it did actually in one case succeed the officers to induce

a dialogue and cooperation between landlord and tenant to implement solutions in spite of the split incentives (Challenges 4a in Table 3). Several of the officers are also trying to address the bigger landlords more broadly than this directly one to one facilitation (Challenges 4b in Table 3). In some cases the municipal were the landlords (Challenges 4d in Table 3), which changes the role of the officers significantly as the one part is actually another internal units.

The means to address the tenant-landlord challenges thus diverts and are therefore discussed further in two separate subsection on respective facilitate specific dialogue between various partners – subsection K and addressing the issue more broadly e.g. addressing bigger landlords, effecting other municipal units and/or making it a political case – subsection L.

Some companies' also encountered challenges related to the overall regulatory framework covering specifically levy on excess heat (category 5a in Table) and conservation rules (category 5b in Table 3). While it actually only were highlighted specifically at a few companies, it were discussed a lot during the project. Similar to the tenant-landlord challenges this related however also to some different means in terms of the such distinction: Facilitate dialogue between various actors, as well as attempt to address more generally e.g. targeted campaigns and/or potentially making a political case. The discussions of these are therefore integrated into the two subsections also discussing the tenant-landlord challenges – respective subsection K and L

The rest of this chapter will in subchapters elaborate on all these 12 different modes of governance in terms of further the governing techniques and means suitable to address the challenges. Focus of attention will be to discuss what this imply for the "reflective dialogue partner" introduced in last chapter:

A. Encourage further collaboration
B. Active follow up on deadlines and encouraging to present their result
C. Use of publicity as active incitement
D. Agitate for the relation to other non-cost saving advantages
E. Use public procurement as possible incitement
F. Use of more firm authority means
G. Advocate for hiring additional staff or take in trainee
H. Financial elements
I. Adjustment of the up front screening and advise from energy consultants
J. Cooperation with other actors to facilitate SME
K. Facilitate dialogue between different parties e.g. Landlord and tenants
L. Address issues on a broader scale e.g. addressing the landlords and/or making challenges a political case

A. ENCOURAGE FURTHER COLLABORATION

Several of the companies were well on track with the implementation of the highlighted savings. For several of these there could be several possibilities for further the cooperation into other areas, e.g. expose as good examples, extend and broaden focus (e.g. Ecodesign and innovation, resources and waste, CSR etc.) as well as specific cooperation and partnering.

As mentioned in last chapter the Carbon 20 project managed to engage some companies in innovation projects aiming to influence companies' broader adopting of the climate agenda in their business strategies**.** As mentioned these projects covered a range of different topics (e.g. Greener products, greener supply chains, alteration of food menus and minimising of food waste, minimising transport, heat regenerating, Crandle2Crandle and utilising of waste, behavioural change of customers as well as more efficient emptying of road drains) and the involvement of the municipality officers also diverted significantly (see last chapter, section 8.8)

Picking up on experiences from these specific innovation project, one of the competence-development sessions were devoted to disseminating and discussing the how to extending focus towards a boarder innovation agenda in future interactions with other companies.

Such broader dialogue would specifically be relevant for companies judge to belong to category 8, 1a and/or 7c in Table 3 e.g. in respect to think climate and environmental aspects into their core business strategy, product development and supply chains; extending focus into the resource, transportation, food and other broader agendas; as well as discussing options for specific cooperation.

Compared to the traditional environmental authority role, this calls for some quite different competences and skills that are even further apart than the facilitating of implementing more or less known energy saving solutions, as was the prime focus

of both chapter 6 and chapter 9. To enter dialogue with firms on innovations alters focus completely from looking specifically at the site in question (the focus of both traditional permitting and inspection as well as implementing energy savings from the screenings) towards looking more broadly in respect to the whole of the company, its product or services and its placement within a supply chain.

The point of departure could be to be able to ask the relevant questions to get the companies to consider such aspects. This calls for some overall knowledge on such broader concepts as eco-design, supplier management etc.

A preliminary topic to take up in the Danish context could e.g. be the recent renewed focus on resource efficiency and industrial symbioses such as the Kalundborg Symbiosis (Kalundborg Kommune, 2011; Kalundborg Kommune, n.d.; Symbiosecenter, n.d.). In prolongation of the government recent resource strategy, the Danish Business Authority have launched an initiative where companies are offered screenings in respect to potentials for finding cooperation on waste reutilisation (Erhvervsstyrelsen, n.d.-c).

The municipal officers responsible for direct regulation of companies would often be centrally positioned in order to spot such opportunities. The officers du visits the majorities of the local production sites with a specific focus on environment including also their waste production. Focus has traditional been mostly on proper sorting and management of such waste and in few cases the preventing of the generation of such. An obvious extension could be to exploit this potential knowledge base on waste products from a large pool of the local companies to point at possible options for profitable exchanges of such waste products – including also excess heat. In addition to be knowledge broker of examples of what other have done, the officers could also be brokers of such possibilities for waste cooperation. A national centre to expose the experiences from the Kalundborg symbioses is e.g. suggesting other municipalities to start the work on implementing symbioses trough active use of the environmental officers as such knowledge broker and facilitators (Fich et al, 2014, Skovberg et al. 2014)

Such an approach might need some overall understanding of which type of materials are relevant for which type of production etc. and/or ability to ask companies whether various waste streams could be of interest. The present of a national offer for the companies enable the municipalities to refer to this (or assist them to get in contact), and/or even establish some kind of agreements on cooperation with those in similar way as attempted with the energy consultants during the Carbon 20 project.

The Danish Business Authority also has different sister programmes that companies equally can seek funding for specific projects related to: 1) implementing “new Green Business Model” centred on e.g. Cradle2Cradle, take-back schemes, product

service systems etc.; and 2) overall green transition (Erhvervsstyrelsen, n.d.-d). The officers could also actively use these as outset for discussing such broader perspectives in terms of the relevance for making specific applications for such – possible even joint. Similar to what Albertslund succeeded with in respect to the LED upgrading of the Albertslund lamp and the energy renovation of type houses (see again section 8.8).

The parallel project, Network for Sustainable Business Development (NBE) in Northern Denmark, has e.g. adopted both the Industrial Symbiosis and New Green Business Models as concepts that they actively promote in respect to the participant companies. NBE specifically also include the internal business support units as a central carrier of such business opportunities into the NBE network and facilitation of companies.

The competences of the officers to address and discuss broader perspectives with companies would furthermore be important in respect to address the subcategory of "other challenge" where companies have lost momentum, when the low hanging fruits have been realised.

B. ACTIVE FOLLOW UP ON DEADLINES AND ENCOURAGING TO PRESENT THEIR RESULT

The officers repeatedly highlighted that the active follow up on deadlines does make a difference for several of the companies. For many of the companies having committed to the agenda, but lacking behind, this follow up it often sufficiently to get attention to the topic and foster the companies to proceed so to be able to present some achievement.

Kind of in the same line several of the officers has also highlighted that getting the companies to present their results at e.g. workshops also can have such motivating effect in terms of getting companies ahead. One officers highlighted e.g. for one of the companies having challenges with top management commitment, that suggesting that company to present its (expected) result for a forum of most of the local business sector actually had the effect that management also got attention to the progress of the project.

Acting as a reflective dialogue partner involves thus to shown an interest in the companies and keep an open and continuous dialogue with the companies about progress including to try to engage them to present their results for a broader audience at specific deadlines.

C. USE OF PUBLICITY AS ACTIVE INCITEMENT

Further to this last concept of provide companies a platform to present themselves at workshops etc. several of the officers – most notably Allerød – have also used other publicity elements actively as a tool to motivate the companies.

Allerød managed to enter an agreement with the local press to make a story for each of the participating companies in the municipality. This was used already in the engagement process to provide companies a platform for exposing themselves as a responsible business. It further allowed the officers to have several cases to show other companies.

Inspired by that, the project decided to use the homepage of the project as platform for creating monthly stories about one of the companies. Some officers, notable those from Copenhagen, have retrospectively been sceptical about the value of this in terms of how many actually read these cases. The establishing of the cases did, however, provide a suitable platform to easily distribute the stories to the local medias in the different municipalities or link up to them on social medias judge by several of the sceptical officers to be a much more appropriate platform for smooth distributions of such stories.

Several municipalities have established a municipal Award for the company achieving the best progress as mean to provide additional incitements. Inspired by Copenhagen and Albertslund already having such Awards, both Allerød and Herning has established such during the project, and the project overall also established one for the two last years of the project. Such Awards are in generally judge to be relevant when applied locally and followed up repeatedly. This relates both to honouring those receiving the award, which actually may keep them motivated, but also to highlight specific achievements to inspire others. Albertslund e.g. jointly awarded a landlord and a tenant, who managed to compromise a solution for overcoming the challenge of split incentives (see later).

Allerød managed to engage the (now former) EU climate commissioner, Connie Hedegaard, to hand out their first award established with inspiration from Albertslund and Copenhagen. This naturally provided high publicity to both the project in general, and the companies receiving the awards.

In addition to providing the companies receiving the awards some free positive exposure, this publicity did in Allerød also contribute to establish political focus on the project, which have been judge crucial for the options for continue the work after the end of the Carbon 20 project.

This indicates that for several companies it is not always just about the specific cost savings. Publicity and other such aspect is for some also significant.

A competence of the “reflective dialogue partner” would thus be to be able to both establish some cooperation with the press etc. to bring stories or establish other channels for exposing the companies e.g. invite them to present their achievements, Award ceremonies etc. It is however also important to utilise it actively in the

dialogue with the companies to showcase such possibilities (as well as internally in respect to the administrative and political backing of the efforts).

Some of the success of Allerød managing to inter the agreement with the local press can be attributed that they had a communication employee closely connected to the project. She had a specific focus on both spot the potential stories and also sell it to the local press. The single officers do not (and can not) necessarily possess all relevant competences. It could be valuable that the team of colleagues involved do possesses some differences in competences so that they can supplement each other.

D. AGITATE FOR THE RELATION TO OTHER NON-COST SAVING ADVANTAGES

Above a conclusion were that for some, the publicity elements were equally important as motivator and not solely the actual cost savings. This insight could also be used specifically in respect to e.g. challenges about internal profitability of projects where there might be some potential for arguing for additional potentials value of such projects justifying longer payback times.

As mentioned in chapter 5, at one of the companies encountered challenges with tighten internal profitability margin due to the financial crisis, the investment related to environmental improvements were allowed longer payback time than investments in general as conceived having a twofold objective of both direct savings and improved image.

Other qualitative interviews carried with the companies further highlighted that for several the potential cost savings were only part of the story for joining the project. For some the more philanthropically argument of “doing good” and “it is the right thing to do” also flourished together with argument of keeping a good relationship with the municipality.

An invited presenter (guest speaker) at one of the workshops during the project argued for twisting the used argument around. Instead of emphasising the potential cost savings as the core argument, it would for some be more relevant to relate the GHG reduction and energy saving to the CSR agenda as a way to do good, that additionally also can provide some cost savings. He specifically referred a survey on SME’s reasons for engage in CSR activities. This survey showed 1) that several SMEs were indeed ingaged in various CSR activities e.g. supporting local sportsclup, and 2) that for most of the SMEs with CSR activities, such were primarily a matter of “doing good” and local engagement and not as such linked to strategic positioning and prospect of revenue and/or savings (EPINION, 2013).

During the project there were some attempt to establish a platform for incorporating “non-energy-related” values of energy savings by e.g. suggesting to modify the simple payback time in respect to also include expected rising energy prices and

other non-energy-related savings that could give companies more realistic picture of the potential. It didn't however manage to establish a model in this project, but other stakeholders (including Local Energy) are also working on something similar (Gudberg, 2012).

E. USE PUBLIC PROCUREMENT AS POSSIBLE INCITEMENT

Both the above aspect of publicity and exposure of the companies as green as well as this doing good CSR aspect do principal relates to nurturing the overall reputation of the companies and eventually increased (or maintained) sales.

The municipalities do also have possibilities for influence sales more directly. Municipalities and public sector in Denmark purchase for around 290 billion DKR and thus is a significant actor in respect to influence market signals trough is direct purchasing power (Moderniseringsstyrelsen, n.d). For several participating companies, one of the main reason for joining the project was to positioning themselves in respect to the municipalities' own procurement of goods and services.

As highlighted in chapter 8 all the municipalities of the Carbon 20 do have green procurement policies in place and also some preliminary efforts to include social clauses and/or innovation aspect as well. Several are also actively involved in specific Public Private Partnerships (PPP) or Public Private Innovation (PPI) projects, where the municipalities join together with companies to find new solutions for municipalities.

The officers have however not managed to find a model to get the companies in question involved properly in the tendering processes. Only in one case under the Carbon 20 innovation umbrella did one of the municipalities actually engage as a demander to test a new application for optimising the emptying of road drains.

One barrier is – as outline in chapter 8 – that quite different units are involved in the procurement, and further that those involved in procurement have been used to focus on the economical best offer. The inclusion of additional and/or other parameters and further engage in specific cooperative settings is rather new for the municipalities.

Previously the EU directive has been interpreted rather narrowly in Denmark emphasising the cheapest offer. The newest amendments of the directive, the agenda of Public Private Partnership and EU various statements about using public procurement as a policy tool to address societal challenges and promote innovations (E.g. European Commission, 2010b) has provided increased space for using the public purchasing power more actively in respect to also address societal values – however still within some competition rules.

The management of the preliminary PPP and PPI etc. has as mentioned not necessarily been anchored in neither the procurement units nor the specific unit of the environmental officers. It is thereby also new for the environmental officers to actually think in terms of whether the company in question actually provide products/services that is of interest for the municipality.

A competence for the "reflective dialogue partner" is thus to work across internal municipal boundaries and units in terms of establish procedure and culture for how to get local companies involved in such tendering and/or cooperation processes, but also to get political support for applying such policies.

In respect to the dialogue with companies, it further imply competences to spot products and services (or potential for developing such) interesting for the municipality, and know how to get these companies involved in the municipalities tendering procedure or specific PPP/PPI projects.

F. USE OF MORE FIRM AUTHORITY MEANS

As mentioned, there were some companies in the project whose commitment has been limited – or even reluctant. This is quite astonishing given the voluntary character of the agreements.

If the "lack of time" response is e.g. just an excuse for lack of commitment, than one need to act accordingly instead of assuming they will adhere to the agenda provided they are provided sufficient incitements, help and aid. The reflective dialogue partner should thus also manage to comprehend what is actually the real challenge, and then react accordingly.

Several of the officers were retrospectively considering how much effort to use on such companies.

Copenhagen has e.g. self-critically reflected about their involvement strategy. In the final evaluation questionnaire Copenhagen stated that they in the beginning of the project was to keen on just getting enough companies to commit themselves in respect to reaching the proclaimed number in the application for EU. Instead more emphasis should have been put into judging the level of commitment by the approached companies and on aligning the expectations.

As stated in the template introducing the "reflective dialogue partner" (See chapter 9/paper 4), a central competence when engaging companies on a voluntary basis is to be able to align ones agenda to be interesting for the company in question and find out what triggers the company and contact person in question. One of the officers in Copenhagen even suggested in an interview that the altering of the contact person to one of her colleagues might have provided better result for one of the particular companies, as the interpersonal "chemistry" might have been better.

However, if it doesn't seem feasible at all to motivate the company even by altering contact persons, a competence is also to accept this and stop using resources trying to do so – at least on a voluntary basis.

Being a municipal officer, they do however have some more firm possibilities for addressing such companies – either themselves or some of their colleagues with the responsibilities of direct environmental regulation of companies.

During the project – see chapter 6 – it has been discussed whether there is legal base for also addressing energy and climate change during the environmental regulation of companies. The conclusion was that energy is an element in the determination of BAT, which is a basic principle for the administration of the environmental law. However, it wasn't clear whether this is adequate as legal base for all kind of companies. The Danish EPA has – in a directly response to questions raised during the project and especially chapter 6/paper 2 – recently clarified, that there is legal base for formulating requirement in permit, but they haven't clarified all the insecurities especially in respect to companies not subject for full permits, but under a simplified scheme or only regulated trough inspections and injunctions; the majorities of the companies actually regulated by the municipalities. Furthermore there is no clear guidance available in respect to how to impose norms in this field given the legal base (see also Dirckinck-Holmfeld and Smink, 2012 and Remmen et al., 2015).

Depending on the size and type of business, energy use etc. it may be relevant to test how far one can go through the regulatory process and thus use a more firm authority role (policeman) in contrast to the dialogue partner, when it comes to these more reluctant companies.

G. ADVOCATE FOR HIRING ADDITIONAL STAFF OR TAKE IN TRAINEE

For many of the companies pointing at "lack of time", the challenges did relate specifically to lack of manpower as other critical (and unpredicted) topics has removed attention on the project. For several of those the possible additional incitement mentioned above (softer elements) would have little effect as not as such related to lack of incitements.

In some of the cases, the companies are seemingly doing well economically – As the officers from Allerød e.g. express for one of the participating companies during the interviews of the 2nd monitoring: "*they are experiencing renewed growth again including new production lines etc., but still hasn't (re) hired new employees after cut downs during finance crises"*.

Others are however still struggling just to survive and are using all their available time on that.

In respect to companies lacking time but doing well, one of the officers from Allerød has begun to encourage the firms to hire additional workforce and refers to the municipality's unit for getting unemployed back into employment – the "jobcentre".

Even in case where the company at present doesn't have the economic possibility – or willingness – to hire a new employee, there can be possibilities for getting some cooperation with the municipal jobcentres.

As shown in chapter 8, Copenhagen municipality has established a scheme of "growth academics" were unemployed university graduates follows a specific trainee programmes and than subsidized by the state, can be "employed" in firms with none or a few academic employees in advance. During the project Copenhagen managed to get some of these "growth academics" connected to some of the Carbon 20 companies.

So far the "growth academics" has as mentioned not necessarily been employed specifically in respect to the implementation of the project. It has however allowed the firms to release some resources and allocate them for the energy saving efforts. The municipality of Copenhagen is currently in considerations of making some more tailor-made reemployment efforts in respect to this green agenda – considering also to enlarge such to other unemployment segments than solely academicians.

As equally highlighted in chapter 8, the municipality of Albertslund has decided that all who interact with companies represent the municipality and should be able to promote the municipality's overall agendas. This mean that officers involved in environmental regulation of companies (and this voluntary facilitation) actually should be able to inform companies on the municipalities overall objectives, agendas and politics – And getting unemployed back on track towards employment is diffidently a crucial task for the municipalities in Denmark.

A "reflective dialogue partner" should thus have an overall knowledge about the municipality's different agendas and seek to activate these in its dialogue with the companies. This also implies competences to actually work across traditional internal boundaries of the administration to spot and support such potential synergies.

H. FINANCIAL ELEMENTS

Similarly to the above challenges in respect to lack of specific manpower, for some the economic challenges related to lack of capital for the investment; not in terms of prioritising the available capital between different investment, but having any capital for investment. Additional incitements offered such companies in these situations would properly have little effect.

The issue of financing has not been an element in the set-up of the Carbon 20 project, whereas the officers have had little options for addressing this. However, financing has been discussed and several involved external actors are also considering different options for establishing various constellations for including financial solutions and offers.

Some of the engaged vendors of various installations especially LED lighting has for the larger projects offered various repayment options or ESCO similar models, where the saved cost due to saved energy is used to pay for the equipment (and installation) over a specified period.

Some energy consultants similarly informed at an evaluation meeting that they have begun to involve various banking institutions to tailoring financing solutions around energy savings e.g. where savings are distributed as payment for the loan. The concept is that the screenings already come with proposals for financial solution that are linked specifically to the suggested savings in the screening.

Such offers do however – like the screenings (see chapter 7) – mainly target the larger companies with higher saving potentials that make it interesting for the bank, the energy consultants and/or the equipment supplier. The quite opposite of the majority of those experienced difficulties of finding the needed capital.

In Denmark many different financial support programs exist that many companies do not know of or pay attention to e.g. the already mentioned funds under Danish business Agency in respect to Industrial Symbioses, new business models and green transition. In addition Denmark have several technological development and testing funds. Most of these have an innovation perspective rather than the implementation of known technology. Furthermore the requirements for receiving the fund are often rather high commanding a certain level of organising capacity often no appropriate available among SMEs.

There are some funds also including implementation of known technology or dissemination of new technology and specifically targeting SME. E.g. ELFORSK focussing on development and uptake of innovative energy-efficient solutions (Elforsk, n.d.) as well as a fund supporting companies to convert energy supply to either district heating or RE that further support energy-efficiency improvement connected to such transition (Energistyrelsen, 2013).

The reflective dialogue partner could have a role to play in disseminating such information; similar to the already suggested advocating for the Industrial Symbioses and New Business model schemes.

Traditionally, the environmental officers have had little focus on such programmes. Opposite many municipalities have business support divisions/sections (or external

cooperation for providing such) and has recently become the formal political anchor of the regional business support centre – Growth Houses (see chapter 8).

Both the local business support units as well as the regional centre have as one of their objective to disseminate such information of various support schemes – often mainly the general business start-up and growth oriented schemes rather than the specific ones focusing on environment, energy or sustainability in general. Being the political anchor for both, the municipalities have the possibilities for influencing them to target more specifically the green agenda in their business support activities.

Kolding have some preliminary attempt in prolongation of the already existing cooperation between the municipality and local business organisation on business support, whereas the mentioned sister project of NBE is already doing some of this specifically.

I. ADJUSTMENT OF THE UP FRONT SCREENING AND ADVISE FROM ENERGY CONSULTANTS

A key element in the Carbon 20 concept was to provide an initial energy screening to the companies. The Carbon 20 project therefore entered agreements with several energy consultants. The expectation was that the existing of the National Energy Saving Obligation Scheme would provide the energy consultants an incentive to cooperate with the municipalities so that it would be possible to provide the screening for free. The project did however pay for some of the screening of the smallest companies as the potential energy savings was judged to little to be of interest for the consultants in respect to the costs of conducting the screening and reporting the savings. The municipalities have stated that they will not be able to continue paying for the screening after the end of the project. Furthermore the consultants have pointed out, that several of the companies actually "sold" the savings to other parties whereas they didn't benefit from having offered the screenings free of charge. It will thus be a challenge to find proper constellations suitable for further the cooperation (see more in chapter 7). While not a challenge specific for the companies encountered during Carbon 20, it will affect the municipalities' capabilities for addressing companies in the future and thus potential significant also altering the findings on encountered challenges.

At an evaluation meeting with energy consultants in the spring of 2013, the consultants emphasised that their gains in terms of energy savings to report in the national EEO scheme has been very limited – especially considering the time and resources allocated during the project.

As the main problem, they pointed at unclear responsibilities within the set-up. The Partnership agreement with the companies did e.g. not commit the companies to also report savings though the used consultants, whereas they could "sell" the

saving to others providing a better "price". There were furthermore no clear directions in terms of whether the consultants could make bilateral agreements with the companies. The consultants thus pointed out that they found it difficult to establish a clear business model as the companies actually can (and some also did) "sell" the highlighted savings to other utilities.

A second issue related as mention to the smallest companies. For several of those, the actual saving potential is judge to be to low in terms of justifying the time and resources used on conducting such screenings.

In spite of these challenges in the current set-up, the consultants participating in the meeting still emphasised that they were interested in continuing the cooperation with the municipalities – especially related to the bigger companies. They did, however, emphasise that the agreements need to be clearer about the role and responsibilities of the different parties. Especially in terms of secure clear business model for the consultants.

For the middle seized and bigger companies, the energy consultants could see good opportunities to adapt the concept to make a more clear link to the potential saving and used consultant. E.g. that a municipality and consultant agree on some specific terms including the reporting of the savings that are included as part of the preliminary "partnership agreement" with the companies, or that the municipality as such "only" conveys the contact between the companies and various consultants whereas they themselves agree on specific terms etc.

Opposite there is a need for much more work to find a suitable model for the smallest firms with little absolute saving potentials. This is further complicated as such for several in principle should also include an extension of the package with both more specific guidance and advice on implementation, as well as including financial solutions – one of the officers named such as the "full packet" of identifying (selected) potential saving options, provide suggestions for financing as well as guidance on or even management of the actual implementation. As the companies are small and their energy saving potentials limited in absolute figures, finding a proper business model is already challenging with only the screening – in spite of the national Energy saving obligation (white certificate) schemes. Extending it further to a full packet increases such challenges.

At the meeting some of the energy consultant agreed in the importance of finding a proper model. Extending on the presentation given based on the findings of paper 3, some preliminary suggestions to reduce the costs of conducting screenings for the smallest companies were:

- Appoint student employee instead of the most experienced consultants,

- The municipalities make pooling of similar and "Neighbouring" companies,
- Provided standard self-assessment tools as baselines and / or
- Use existing or establish some standardised data for calculation of saving of most common options for SME – such are e.g. often used in the domestic market rather than the specific calculations used in the business segment.

At the meeting no specific solutions were found, but at least one of the energy consultant is partner in projects succeeding the Carbon 20 attempting to test different models for how to provide the smallest SME the full packet (see next subsection below).

In direct prolongation of some of these findings from the Project 20 (and paper 3), the Local Government Denmark (LGDK), has initiated a political process of lobbying for altering in the overall EEO scheme in respect to make it more targeted the SME (and dwellings) rather the biggest companies. Many of the bigger companies are as mentioned subject for mandatory requirements to carry out periodically screenings du to the EU Directive on Energy Efficiency (Directive 2012/27/EU). This reinforces the low additionally of the EEO scheme as the scheme currently especially target these companies that are to be obligated to conduct such anyhow.

J. COOPERATION WITH OTHER ACTORS TO FACILITATE SME

During – and in prolongation of – the project various other constellations to address this challenge of proper guidance for the smallest companies have been taken and/or discussed.

Copenhagen succeeded in connecting an intern to specify the options suggested in the screening into concrete proposals including managing the process of receiving specific offers. Copenhagen later used him for the whole process and dropped to get the energy consultant engaged in the first place. In the parallel project of ProjectZero in Sønderborg of southern Denmark, they have also used a trainee/student to conduct the specific screening and subsequent facilitation of implementation for small stores.

Copenhagen is, as mentioned, also considering extending upon the experiences of matching "growth academics" with companies showing interest in the green agenda to establish some more tailor-made job-training courses in energy savings. The "trainee" would thus not only release resources to focus on energy savings, but actually also facilitate the actual implementation process at companies who have not the competences nor possibilities to employ additional workforce or engage external consulting for this.

Allerød has in preparations for continue the work after the project made some contact to the local jobcentre to discuss options for establishing something similar. They already have engaged "a trainee" internally, where the intention is that he after a period in the municipality should be used for facilitating implementations at companies.

The prospect of these trainees actually getting job afterwards seem promising as it has been stressed that qualified workforce within the energy savings and efficiency field is lacking (e.g. in the electronic newsletter on the Energy topics "Dansk Energi" 5/3 2014).

A few municipalities have engaged various other actors as well e.g. electricians to conduct both screening and implementation – again most notably Copenhagen. In few cases it also proved successful, however in the majority of the attempt the electrician still had difficulties finding a proper business model.

Copenhagen has lately tried to engage an actor from the domestic sector, being specialised in offering the full "packet" of identifying potentials, bringing suggestions for financial, as well as craftsman to implement the solutions for the households.

Similarly Kolding is as mentioned participating in the green business growth project (http://www.groenerhvervsvaekst.dk) aiming at getting local craftsmen (re) employed with energy renovating private houses, where they currently considers if they can extend it to the SME sector.

A constrain for applying the latter two concept targeted private housing in respect to the SMEs is that the majorities of those do not own their buildings. This means that the companies cannot uptake loans with the buildings as security/guarantee as is the norm in the domestic market. This relates thereby to the challenges of the split incentives between tenant and landlords as barrier – see next subsection below.

Currently several of the municipalities are evolved in some succeeding project focussing specifically to test varies models – including cooperating also with some of the used energy utilities to orchestra the registering and distributing subsidy in relation to the national EEO scheme.

Finding a proper business model that could help these companies is a challenging task, but municipal officers can potential have a role to play in respect to make a first judgment of potentials and get the right consultants, internal trainee or job trainee etc. connected, gather similar and proximate companies that enabling quick and dirty assessment of several alike companies as well as orchestrating the formation of proper constellations of actor that combined can offer proper business models.

K. FACILITATE DIALOGUE BETWEEN DIFFERENT PARTIES E.G. LANDLORD AND TENANTS

As mention Albertslund jointly granted a tenant and its landlords an award for finding a concept for realising saving across the split incentives of landlord and tenants.

The officer as well as the used energy consultant – the local district heat company that still is an internal unit of the municipality (governing trough provision) – did have a crucial role to play in facilitating them to overcome the challenge. One of the decisive element were to use the possible conversion to district heating as platform for a broader dialogue to include several other aspect in this project that normally fall between the two. As mentioned this implementing of energy savings in prolongation of a conversion to districting heating (or use of more RE) has later become a specific topic of a national support programme.

Building on this case, there seems to be some potential in facilitating tenants to get in dialogue with their landlords on specific possible (and profitable) solutions that otherwise would be judged to fall between the spheres of both. In the specific case the switch over to district heating was used as the central entrance point for the discussions, which now is even supported by a national fund.

A competence for the reflective dialogue partner, when approaching a specific tenant, would thus be to spot if there are solutions that fall between the two as well as judge if there are basis for advocating for the involvement of landlords.

The case was however a single one. The officers having the dialogue with the company did acknowledge, that the case could be used as a good example – reason why they where granted the Award. However, she also stressed that it haven't succeeded in any other cases. She therefor emphasised that there is a need for a broader addressing of the challenge – e.g. targeting the landlords generally rather than addressing the tenants; and further to put political focus to the challenges (see below).

Copenhagen did in respect to the five companies placed within the broader business district of the "meat packing city" partly succeed in establish some progress on the dialogue between the different partners. The meet packet district is however quite different in several aspect.

First of all the buildings are listed and thus subject for some conversations rules that hamper the implementations of especially energy renovations of the envelope. Any solutions need thus to be specifically designed for that area and approved by the conservations body instead of standard solutions, which naturally increases cost.

The buildings are furthermore owned by the municipality (Copenhagen is thus the landlord), whereas the role of officers in the Carbon 20 project change character in respect to affect internally rather that external private actors including thereby also a political angel.

One of the participant companies – an architect specialised in renovation of listed buildings – have been involved in finding designs solutions that both improve the energy performance and keep the expression of the area. However no final solutions had been approved by the conversation body due to among others hesitations from the municipality as landlord to actual show real interest and push for decisions. The architect's main argument for joining the Carbon 20 project was to reboot this process hoping that the active engagement in such project together with the municipality could push for a renewed focus.

The attention given to the topic by the project seems to have provided room for a renewed dialogue between the various partners. The conversation body has e.g. approved to test the installation of solar cells as "an technical installation" that can fit the impression of the area. This shows that they indeed are willing to find solutions.

During the project it equally also succeed the Carbon 20 officer in Copenhagen to establish some dialogue with the municipal unit responsible for managing those buildings. During the project it did succeed to address some of the issue – however, only the low hanging fruits manageable on the general operating budget of the municipal and not the real challenges that needs political support and allocation of extra resources to fund the renovation needed.

In respect to the "reflective dialogue partner" this internal dialogue do calls for political navigation skills in relation to own municipality organisation. As municipal officers they are used to navigate in respect to especially own projects and topics. However, not necessarily navigation that cut across diverse organisational and administrative boundaries and interest.

The 5 companies participating in this project is only a small number of the companies located in the "meat packaging" district with Copenhagen municipality has landlord. Renovating the whole area as one project might provide potential for a large-scale project – maybe even experimenting with some kind of ESCO models etc. This requires that several diverse actors – both diverse tenants, internal municipal units, the conversation body etc. managed to agree. Facilitating this process will properly extend the typical task of the officers involved in a project like Carbon 20.

The officer having had the contact with the 5 companies is considering conducting a concluding meeting involving the companies, municipality and the conservation

body in respect to presenting the experienced challenges as outset for a renewed focus.

The outcome of this whole process – whether failure or successful in reaching actual solutions – do also provide perspective for taking it up on a broader scale. Both in respect to this latent conflict between conservation vs. (energy) renovation, but also in respect to how the municipalities should act as landlords.

As mentioned in Chapter 5 especially the levy on excess heat were discussed a lot during the project mirroring an intense national debate on this topic as well. (Skatteministeriets og Energistyrelsen, 2006; Viegand Maagøe, 2013; Viegand & Maagøe og SRC International, 2009).

As also underscored the challenges were only specifically highlighted for few companies and this included even companies were it actually succeeded to address it during the project – e.g. regenerating excess heat from production of glass to be used in local district heat company in Næstved. In this case the officer from the Carbon 20 project were central for mingling and push for solutions among the various actors of respectively the company, the district heat utility as well as the municipal units responsible for overall heat planning and approval of the needed constructions. This underscores this competence of a reflective dialogue partner to orchestra getting different partners to cooperate.

Acting upon this experience and similar during the carbon 20 project, as well as a resent report on the topic, Viegand Maagøe (2013), one of the officers in Albertslund have commenced a campaign approaching several of the relevant companies. The Viegand Maagøe reports among others states that it is rather complex whether a solution is subject for levy or not[43]. It further showed that the legal frames had been altered in early 2013, which means that in most cases the utilisation of excess heat will be a rather good investment with short payback time (Viegand Maagøe, 2013).

As the rules are rather complex, the officers has again teamed up with the local district heat company – as mentioned an internal unit – to explain the rules and

[43] The levies relates to two situation, and have different reasoning: 1) Internal utilization of excess heat from process to general heating, where the levy shall ensure that the energy to process is used optimally and not as a way to avoid paying higher energy prices related to general heating; 2) The supply of excess heat externally, where the levy shall secure that enterprises providing excess heat are under same market conditions as e.g. district heat producers, who pay other and higher levies than energy for processes. Far from all heat recovery are subject to levies. The present of a potential levy makes several companies perceive it as an obstacle for even assessing the possibilities (Viegand Maagøe, 2013).

point out the potentials – also as potential customer of the surplus heat in terms of utilising it in the district heating as with the case of Næstved.

In respect to the role of the "reflective dialogue partner", a first issue is thus to determine the character of any preliminary pointing at the levy as a barrier. In most cases the companies have not made any specific calculations and in some cases the solution might not even be subject for the levy. A central aspect could thus be to distribute knowledge about the actual rules and its impact. The officers do not necessarily need to know the specific rules, but need to engage suppliers capable explaining the rules, provide oversight and make specific calculations. However the officers can take a first dialogue and provide some basic insights.

L. ADDRESS ISSUES ON A BROADER SCALE E.G. ADDRESSING THE LANDLORDS AND/OR MAKING CHALLENGES A POLITICAL CASE

As shown above several of the challenges related to both tenant-landlord as well as the regulatory frames did in addition to such direct facilitation of dialogue between partners also calls for addressing it more broadly.

In respect to the tenant-landlord challenge, several of the municipalities are now also in a process of approaching some of the bigger landlords administrating several properties as conceived as a more efficient approach to reach a larger group of the smallest companies.

The crises have resulted in increases of empty office- and workspaces etc. and thus increased competition in the rental sector. The officers express that energy efficiency and sustainability is increasingly becoming parameters for competition and therefore judges that there may be some opportunities for addressing the bigger landlords.

Under the heading of "green rental agreements" Copenhagen has initiated an effort to cooperate with various landlords to find a model that allow and specify under which condition energy improvements can be made during the rental period.

As part of the 2012 political agreement on Energy (Regeringen, 2012), the tenant-landlord challenge was addressed in respect to the domestic sector. The agreement provides both the tenants some options to renovate and be compensated in respect to the added value gained, while also allowing landlords to make investment and subsequently raise the rent equal to the savings du to lower energy need (Regeringen, 2012).

Compared to the domestic rental market, the rental market for commercial use is far less regulated. In the domestic rental markets there are specific laws about responsibilities in relation to renovation etc. The commercial rental market is in

contrast based on a high degree of contractual freedom. This means that the landlord and tenant principal need to agree in advance of e.g. distributing of the maintenance obligations (Ministeriet for By, Bolig og Landdistrikter, n.d.). The contractual freedom of the commercial rental sector implies that there already is room for applying similar concepts as those suggested for the domestic sector in the 2012 agreement. It does however need to be formulated specifically in the contract – precisely what Copenhagen is now attempting to promote.

Copenhagen further emphasises that the challenge could also be taken up nationally in respect to establish overall incentives for overcoming this challenge, and/or disseminate the possibilities to actually address this by the concept of green rental agreements.

In respect to "the reflective dialogue partner" the competences to address the landlords more broadly differ significantly from the approach of addressing the tenant. The crucial argument here would not be potentials for cost savings, but rather the potentials that energy performance can become a central competition parameter for the office and workspace rental sector and thus for renting the building out in the first place.

A skill of the reflective dialogue partner would also be to navigate the options for making it a political focus e.g. highlighting both cases where it is a challenge, but also those cases where it actually have succeeded to address the challenge.

Equally to address the private sector landlords, the officers can also act internally to make it a topic of how the municipality act as landlord

Many Danish municipalities have had a strong focus on improving the energy aspects of their own directly controlled emission including the operation of their own institutions and improving the buildings they are located in – both in respect to the cost savings, but further as the good examples by "cultivating own garden first". However, apparently less attention has been given to situations, where they act as landlords.

It seems obvious to extend the focus from optimising own institutions and buildings towards also deicide on how they should act as landlord. The role of the officers from the Environment Department would thus adhere to that of addressing the property owner generally – here just internally. As the municipalities in contrast to private landlords are a political institution with diverse interest, the task of the officers differs by making it more depending on political navigation between diverse competing interests – and thus lessor an argument that it will become a parameter of competition.

As the municipalities have been through (or are in the process of) an optimisation of own buildings, the competences are likely properly available even though it might be in other units. Such competences could further – depending on the status of renovation of own buildings – be activated in the direct facilitation of the companies – e.g. for those smallest companies where the interest from external consultants are lacking.

In relation to the regulatory framework there could also be potential in bringing the agenda up on a different (higher) level.

During the projects it was considered to make the challenges of levy on excess heat a political case in order to put pressure back to the political system to alter the levy scheme in question. It proved however difficult to get some the companies preliminary pointing at the levy as a challenge to engage in making it a political case or even deliver the needed data for such a case. The rules were as mentioned adapted anyways in 2013. Instead of making the "challenge of levy on excess heat" a political case, there may instead be potential for disseminating that it actually in most cases can be a good investment e.g. building on the experiences from Albertslund with their campaign and/or the case of Næstved utilisation of excess heat from glass production in the district heat system.

10.2. CONCLUSIONS AND RECOMMANDATIONS

This chapter has furthered last chapter introducing of the Reflective Dialogue Partner by discussing what competences and means such reflective dialogue partner can use to address the varies challenges that companies may encounters as highlighted in chapter 5. The Chapter combines the insight from all the previous 5 chapters into a specific discussion of how to adjust and adapt municipal officers practise in using suitable governing techniques towards the diverting complexity of the system to be governed.

The chapter thereby provides a preliminary answer to the overall research question of the PhD in terms of highlighting a variety of different specific means that the municipal officers can use to influence companies to make GHG reductions. The focus here is the environmental officers as those involved in the Carbon 20 project and how thy as reflective dialogue partner could act to pose a change among the companies.

Such means and competences could include:

- A frequent and persistent following up to keep the focus on the agenda,
- Show interest in the companies general business situation and navigate to align the energy saving and climate agenda into fitting what triggers their

enthusiasm - whether it is the technical possibilities, specific saving potentials, external exposure, CSR, funding possibilities etc.

- Be adaptive in applied strategy in respect to the challenges of the companies – including e.g. altering who conduct the dialogue if judge could help
- Be able to spot potentials for the good stories and capable of selling those to the press and/or creating stories for the web and social media
- Be prepared to drop or use more firm means for affecting reluctant companies – e.g. using the possibilities to address energy etc. in environmental permits etc.
- Use the positive processes as outset for an even broader focus on resource efficiency, industrial symbiosis, ecodesign, supply chain, green business model, cradle2cradle etc.,
- Organise and steer various network activities and specific sessions on various topics of interest
- Be able to find different settings for involving external actors, that can add to the process and see possibilities for establishing a business case – e.g.
    - Energy utilities and their consultants,
    - Equipment supplier,
    - Electricians and other craftsmen etc. in respect to being the ones facilitating the implementation of solution;
    - Banks or other financial institutes in terms of bringing in the finance solutions
    - Consultants etc. specialised in the dwelling sector
    - Knowledge - and education institutions
- Challenge such external consultants to adjust their services to include the whole packet of finding solutions, bringing the finance and manage the implementation – also in respect to the challenges specific for the smallest companies, where the possible savings often are to small to be interesting for those intermediates;
- Be able to initiate and mediate dialogue between different central actors for implementing the proper solutions – e.g. between tenants and their landlords (also if municipality itself) as well as others actors such a conservation body or between neighbouring companies and/or district heat supplier in respect to reutilisations of excess heat etc.
- Act internally across administrative and organisational boundaries to activate internal resources and capabilities and pair different municipal agendas – e.g.
    - The “jobcentre” in respect to re-educate unemployed workforces to function as trainee in the companies etc.
    - Internal energy optimisation unit to provide assessments at companies
    - The property administration in terms of affect how the municipality act as potential landlord

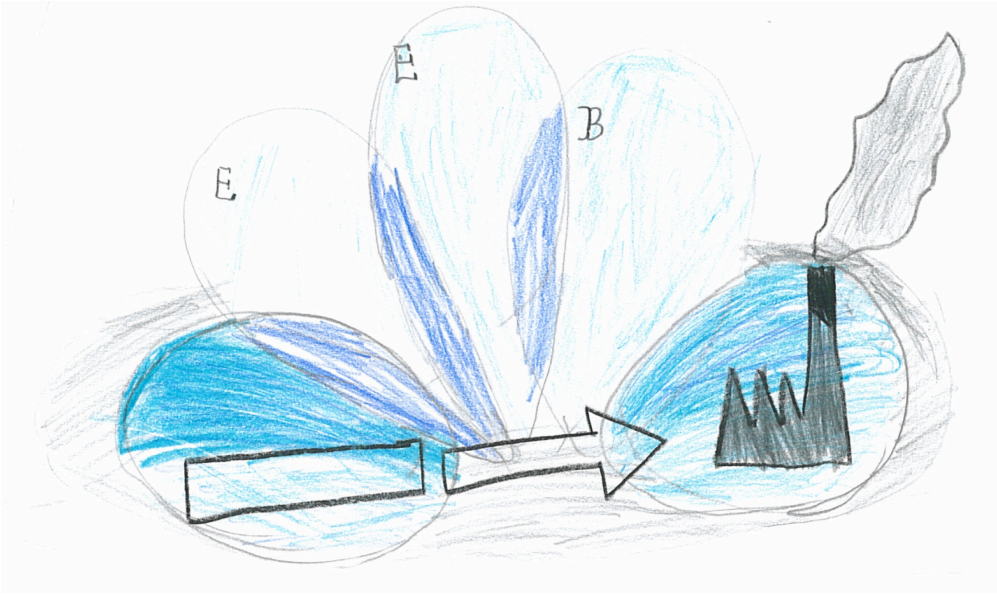
    - The procurement units in terms of establish procedure for how to get companies involved in the municipalities tendering and procurements or even for how to engage companies in specific PPP or PPI projects
    - Business support unit in terms of finding synergies between the business perspective and green perspectives in terms of seeing possibilities for new business opportunities on the green agenda, as well as provide insight into the various funding opportunities etc.
    - The building approval units in terms of informing and/or requiring high energy standards
- Navigate politically in respect to get both administrative as well as political attention, focus and backing on various topics
- Provide feedback to and/or activate the political system about conceived challenges that need change in the overall regulatory frames or a broader dissemination of possible ways to address them.
- Spot potentials for more specific joint collaboration and partnering on development and testing of new solutions to municipal challenges

Clearly all those numerous competences and skills extend beyond the capabilities of the single officer – even one managed to become a "reflective dialogue partner". A challenging task for the teams (units) as a whole is thus to secure that a variety of competences are represented, and that the colleagues managed to supplement each other, engage colleagues from other units and/or cooperate with external partners to bring the needed competences into play in the different situations.

The preliminary conclusions drawn here in respect to the Carbon 20 officers' possible adaption of practise is picked up in chapter 12 suggesting a generic model on the municipal level.

Before that, chapter 11 is a recap of the conclusions from the last six chapters in respect to the conceptual framework presented in chapter 3.

PART C. CONCLUSIONS AND PERSPECFTIVES OF THE PHD



CHAPTER 11. CONCLUSIONS FROM THE PREVIOUS CORE ANALYSES

This chapter forms the first of three chapters drawing up the main conclusions, learning and contributions from this PhD thesis.

In chapter 1, I presented the overall research question as concerned with how municipalities can encourage local companies to reduce their GHG emissions. I further divided this into five subsidiary research questions, each addressed in separate chapters, as well as combined in a chapter providing a preliminary answering of the overall research question on an officer level.

In chapter 2, I outlined two core academic interests for the study: the scientific problem related to the practical problem of the research question. I argued that I applied both 1) a *governance* perspective of the municipality (local government) governing role in respect to implementation of GHG reduction, as well as 2) a *learning* perspective on the municipalities (officers) learning from the project. Both perspectives consist of a twofold focus: a) the direct impact on the particular case and the context surrounding it; and b) the broader impact with respect to providing inspiration and learning for both other municipalities and the academic discussions about municipalities and local government climate governance.

In chapter 3 my conceptual framework was presented, whereas chapter 4 outlined how the subsequent chapters 5-10 each related to specific elements of that conceptual framework.

This chapter follow up on chapter 4 by drawing up the conclusions from the six previous chapters in light of the analytical framework presented in chapter 3 and the links described in chapter 4. This chapter thereby provides a summery of the conclusions on the practical problem as formulated in the research question and sub questions. The five sub questions was analysed in chapter 5-9, whereas chapter 10 addressed the overall research question in terms of the skills and competences of the municipal officers to influence companies to address GHG emission reductions.

This preliminary addressing of the overall research question in respect to the officers' competencies is in chapter 12 brought to the municipal level suggesting a conceptual model for a successive enlargement of different components to include in a municipal strategy for influencing the local companies.

In chapter 13, the two "scientific problems" of respectively the learning and governance perspective are addressed in terms of discussing, how this PhD thesis

has contributed to each of these four sub-interests derived from the two scientific research perspectives.

11.1. THE COMPLEXITY OF THE SYSTEM TO BE GOVERNED

In relation to the analytical framework presented in chapter 3, chapter 5 addressed the system to be governed. As presented in the conceptual framework Kooimann specifically argues that the governing approach needs to be flexible in respect of adapting to the diversity, complexity and dynamics of the targeted systems to be addressed or governed. To elaborate on Kooiman's overall conceptualisation of any (sub)systems to be complex and diversified, the framework included Porter's (1979 and 1985) conceptualisation of company actions as a response to both internal and external dynamics, describing a much more diversified understanding of how companies respond in given situations than typically for more neoclassical assumptions of firms as rational sub-optimising units.

In chapter 5, it is confirmed that companies are different and face quite diverse challenges, when implementing energy savings, and therefore calls for an adaptive governance approach.

Based on the case of the Carbon 20 project, chapter 5 identifies specific prototypical challenges that the adaptive governance strategy of the municipalities should aim to address – se Table 3 in last chapter based on the table of chapter 5.

The vast majority of the challenges encountered during the Carbon 20 project related to "lack of time/priority" and/or "economic challenges". This finding confirms several of the previous contributions (surveys) of company challenges in implementing energy savings.

It was however also found – as shown in Table 3 – that the actual challenges within these overall categories varied – especially in respect to its implications for how the municipalities can address such challenges. There are for example differences in terms of how a municipality should and can act in relation to 1) an enterprise committed but behind own ambitions, or 2) enterprises basically not committed, but using lack of time as an excuse. Both of these responses are related to the overall categorisation of "lack of time or other priorities".

While generally in alignment with previous contributions on the overall categorisation of the most encountered challenges, this analyse did differ in relation to one of the overall categories. A comprehensive assessment of earlier survey found that the category "split incentives" was not encountered significantly in such earlier surveys. Contrary to that, but in alignment of an expert judgement by the Danish Society of Engineers (IDA), it was in chapter 5 found that challenges related

to split incentives between "tenant and landlord" were encountered significantly as the third most.

Similarly, chapter 5 also found challenges related to the regulatory framework. A challenge most of the newer contributions within the "energy gap literature" do not address, but again something as the expert judgement of IDA also highlights. Compared to the debates during the Carbon 20 project, particularly on levies on excess heat, the specific statements on this topic were however relative few. This indicates that there seems to be a discrepancy between what have generally been perceived to be the challenges, and what was specifically highlighted in relation to the individual companies.

Challenges related to the knowledge and skills required to implement solutions were also found in spite of the companies being provided with energy screening free of charge. Again huge discrepancies were registered in terms of the much debate during the Carbon 20 and the rather limited number of specific statements. The challenges related furthermore mostly to a lack of technical knowledge, and lessor to the otherwise highly debated challenge concerning lack of management skills to implement solutions.

At almost one fifth of the companies it was specifically highlighted that no challenges were encountered at all; information that is often not even addressed in previous contributions.

The objective of chapter 5 was to provide a departure point for the municipalities to adapt their governance strategy. In that respect the main findings were:

- Time constraints and subsidiary economic challenges are encountered quite often. More than half the companies had encountered either or both of these challenges. Preparing to address such challenges would be useful.
- The actual challenges were however diverse in relation to both time constraints and economic challenges. Some are linked in terms of time and economic challenges and/or to other challenges; some related to lack of capital while other focussed more on internal profitability aspects; some were excuses and some conversely represent a strong commitment in terms of lagging behind their own ambitions rather than behind the formal expectations of the municipalities.
- The facilitation therefore calls for a flexible and adaptive approach based on a situated understanding of the specific company and its challenges. A robust strategy should apply a combination of a variety of different influencing actions – not necessarily one size fits all.
- Voluntary facilitation seems to be a proper strategy for several companies. For some companies, however, additional incentives may be needed.

Challenges related to survival and/or no commitment, for example, call for completely different approaches.

- The split incentives between landlord and tenants need to be addressed in the Danish context, especially in relation to smaller enterprises.
- Similarly other contextual challenges e.g. related to overall regulatory framework may also need attention, e.g. in terms of clarifying the actual rules.
- In spite of offering the screening free of charge, the information and skills to implement the solutions were still highlighted as challenging. However, the statements were fewer and furthermore different than expected based on the articulation of these challenges throughout the Carbon 20 project. The challenges are more related to technical knowledge than skills; including also insecurity about the suitability of the suggested solutions.

Almost 20% hadn't encountered challenges at all. This could call for a closer cooperation to expose such success stories and/or extend the focus into other more innovative and broader concern

11.2. THE ARENA OF DIRECT ENVIRONMENTAL REGULATION

Chapter 6 is the first of three chapters that address the role of the municipalities within the vertical governance system in terms of the respective the arenas of: direct environmental regulation of companies, the overall energy saving policy framework, and the business development scheme.

Within each of these three arenas the chapters address:

1. The dominating and conflicting discourse(s) of the arena
2. The constituted framework or 2nd order governance
3. The actual regimes of practices performed (and techniques applied) by the municipal officers

The chapter 6 addressed these elements in respect of the arena of direct environmental regulation of companies in Denmark. The essential of chapter 6 is an article published in Journal of Cleaner Production.

In Chapter 6 the dominating discourse of the environmental regulation was contested based on the regimes of practise of the municipalities.

It was shown that the dominating discourse within the environmental field is that regulation is moving towards a smart regulatory approach centred on endorsing before enforcing companies to adhere to the environmental agenda using pollution prevention and win-win strategies before commanding end-of-pipe cleanings and dilution. This relates both to the international academic literature, but also the

Danish debate. Around the millennium Denmark was viewed as being well on track with this transition in respect of both company performance and the implementation of such smart regulatory approaches.

In chapter 6 it was showed that there is a gap between the actual practices of the municipalities and this overall discourse. The practices of the municipal officers were based more on the traditional command-and-control regulatory approach and based on end-of-pipe based norms.

With this implementation gap outlined, the paper focussed on assessing the regulatory framework more closely to identify constraints and options for the municipalities to alter their practices.

The constraints found in chapter 6 falls into two different but related elements of the regulatory framework:

1) The legal basis for addressing pollution prevention, cleaner technologies, resources and especially energy and GHG reductions in requirement, and
2) Adopting a more facilitating approach in the direct regulation of companies.

In relation to the first issue, it was highlighted that:

- The regulatory framework is blurred and fails to provide proper directions for the execution by local officers in respect of pollution prevention, energy etc.
- There is a legal basis to formulate requirements on energy, waste prevention etc., in full permits, but this is not clarified in respect of either simplified permits or injunctions.
- The legal basis and options to address energy etc. are closely connected to the term of BAT. However, the reforms of the 2000s significantly reduced the local jurisdiction and competences to address BAT.
- Opposite, the Danish EPA is beginning to address the topic, emphasising that energy is to be considered a significant focus.

In relation to the second issue, it was found that:

- There is an interest and also the possibilities for addressing energy etc. through a catalytic role during inspection;
- This catalytic role is perceived as additional to the required authoritative role and is therefore dependent on local priority in the municipality;
- The reductions in public finances and resources have put pressure on the direct environmental regulation activities and especially the aspects considered ‘additional’;

- The reforms of the 2000s also altered the meaning of the term "differentiation" – as related to frequency rather than situated approach. This has contributed to a down prioritising and loss of competences in the more dialogue-based catalytic approach otherwise mostly practised at the companies having a regulatory relief under the new differentiation;
- In spite of such constraints, several of the municipalities seem to continue to prioritise a local voluntary effort and are especially seeing possibilities in the newly adopted inspection orders introducing the concept of inspection campaigns.

The outlined constraints related to the regulatory set-up should be addressed in order to improve possibilities for addressing energy and GHG emissions as an integrated element in the day-to-day practice of the direct regulation of companies.

However, even without such altering of the regulative frames, it was in chapter 6 emphasised that – if given priority locally – there are possibilities within the framework for applying more preventive approaches.

There are indications that a continued focus on climate change, energy, resources and green growth are triggering a renewed focus on the need to address broader environmental concerns and reintroduce a more facilitative and catalytic role as an integrated element of the direct regulation of companies. A governmental appointed expert group has highlighted that the Danish regulation may need rewriting to align it more closely with the EU regulatory set-up. The Danish EPA has furthermore commenced a process to assess existing practices, and has made some preliminary clarifications of the regulatory framework. It would be possible to take up these conclusions in this work and alter some of these constrains.

Similarly, the Carbon 20 municipalities are not the only ones with focus on how municipalities can use their authority role more actively in terms of stimulating company actions on broader environmental concerns. Based on his experiences from the NBE network in Aalborg and Hjørring, the head of the working group under an organisation of technical executives in the municipalities, KTC (and environmental manager at Aalborg municipality), has also argued for some of the same issues (Damm, 2014).

11.3. THE ARENA OF ENERGY EFFICIENCY POLICIES

Chapter 7 is also addressing the discourses, constituted framework and regimes of practices within a specific governmental arena – here the energy saving policy framework. The essential of chapter 7 is a paper presented at ECEEE industrial summer study 2012. In chapter 7 is analysed the practise of the municipalities' cooperation with energy consultants in light of the existence of a Danish national

energy efficiency obligation scheme (EEO) that requires energy utilities to find energy savings among end-users (business and dwellings/households).

Both in the Danish context and internationally, the dominating discourses on EEO (Energy Efficiency Obligation) and White Certificate schemes claims that such brings value in terms of among others:

- An economic rationalising that the trading of white certificates provides cost efficient savings.
- An emphasis that energy efficiency obligations offer incentives to provide tailor-made consultation of SMEs in order to realise savings.

The regulatory and institutional setting of the Danish scheme is basically an EEO in terms of requiring energy utilities to find savings for end-users. The energy utilities are however provided with a high degree of methodological freedom in finding the most cost-efficient savings. This has resulted in the creation of a de facto white certificate scheme, where the utilities can fulfil their requirement by "buying" savings identified and realised by others.

In the preliminary years of the scheme, the energy utilities mostly relied on internal consultants to find and help realise the savings. In recent years the utilities are increasingly – and sometimes solely – relying on buying the savings from third parties that have identified them. This has resulted in a broad variety of different actors involved in this market for finding cost efficient savings to be sold to the utilities. It has also blurred the picture somehow in relation to understand the actual mechanisms: what offers are provided by which actors, what is the actual "prices" in terms of the varied grants offered by the different actors, as well as what are the requirement for documentation etc. in specific settings.

The most recent evaluations of the scheme point out that it overall has succeeded in finding cost-efficient savings and thus providing socio-economic benefits – at least in the business sector.

However, a critical reading of the evaluations and the accompanied assessment (testing) of samples of the specific reported savings reveal several critical points as well. It is, for example, noted that for many of the reported savings there seems to be a significant gap between the reported savings and the actual realised savings. Furthermore, the evaluation judges that the additionality of the scheme is rather low. A high percentage of the reported savings would likely have been realised anyway without the active contribution of the scheme.

This is interesting and calls for further critical attention in respect of the contradiction between the two often-highlighted assets of such schemes, but this has

not been the core focus of chapter 7. Instead, focus is on the actual practice of collaboration between municipalities and energy consultants in light of the scheme.

In respect to this, several difficulties were also highlighted:

- The specific set-up chosen for this cooperation didn't seem to provide a proper business case for most participating energy consultants. The agreement didn't commit the companies to report the savings through the consultants used, whereas the companies in principle could – and some also did – sell the savings to others but still use the provided screening as documentation.
- For the smallest companies, the actual potential savings (in absolute terms relevant to the energy saving scheme) proved to be relatively low. Therefore, the "value" of the savings for the energy consultants is often outweighed by the cost of the screening at the smallest companies.

In spite of these difficulties, there seems however still to be both willingness and potential to adjust the cooperation arrangement and continue some kind of collaboration – at least in respect to the larger companies.

In the chapter 7, some possible pathways for finding proper models for also addressing the smallest companies were pointed out for further elaboration.

After finalising the paper in 2012, additional events and activities related to the topic and conclusions of the paper took place during or in prolongation of the Carbon 20 project. This specifically involved three elements.

1. Evaluation meeting with the energy consultants

An evaluation meeting was organised in 2013 among the Carbon 20 municipalities and some of the participating energy consultants. This meeting confirmed the conclusions of the paper and emphasised that the business case for the consultants indeed had been limited with only few reported savings. In spite of this, the parties still showed interest in a continued collaboration.

During the project, the municipalities had obtained a more precise picture of the overall scheme and what is required to make it a proper business case for the consultants. The energy consultants had equally obtained specific insight into such locally driven programmes and the need for a broader information flow among the different actors. Based on the experiences most seemed confident that it would be possible to find a locally adapted model for further collaboration – at least for the larger companies – for example: that the municipalities refer companies with a saving potential to the energy consultants, who then make the agreements with the companies without involving the municipalities.

All parties acknowledged the need for and showed interest in further discussions to find proper models for targeting the small companies. The different pathways pointed at in the paper were discussed, but no specific plan, concrete proposals or even agreement for further collaboration to find a model ware made.

2. New projects targeting the smallest companies

While no particular proposal for how to target the smallest companies was made at the meeting, new projects have been initiated afterwards aiming to find a model addressing the smallest companies.

The municipality of Copenhagen began a new project attempting to engage various partners (electricians, student employee/trainee, and energy consultants specialising in the domestic sector etc.) to find a robust model for addressing the smallest companies – meaning a model that can function on "market" terms without the municipality needing to pay for the screenings.

Similarly, Gate 21, together with the municipalities of among others Allerød, Albertslund and Ballerup has also commenced a project on this. This latter even involves one of the energy consultants used in the Carbon 20 project, who orchestra the distribution of support and the reporting of savings.

3. Political lobbying to adjust the EEO scheme.

The interest group of Danish municipalities, Local Government Denmark (LGDK) also picked up on the findings of the paper. At the final conference of the Carbon 20 project, LGDK presented a political statement commencing a lobbying process to adjust the energy efficiency obligation scheme so that it more specifically provides incentives to target the smallest companies (and household sector). Being the interest group of Danish municipalities they agitate for an active role of the municipalities in the allocation of funds.

11.4. THE ARENA OF BUSINESS DEVELOPMENT AND GREEN GROWTH

Chapter 8 is the third chapter looking into the discourses, constituted framework and actual regimes of practices within a specific governmental arena – here business support and green growth.

The point of departure was taken in the emerging change of discourse on the public policies for business development and growth, where the public is reintroduced as a driver for pointing out the direction. It was further shown that the practises of the municipalities on the green growth agenda also relate to altering discourses on innovations dynamics, regional development as well as public private partnership.

Traditionally, distinctions have been made between the "pro-business policies" of "picking the winners" versus "pro-market policies" of "levelling the playing field". Both these positions and discourses have merged into a mixed policy approach that on the one hand adhered to the market-driven principles of applying a transparent business support and growth policy framework, but conversely also emphasis that the public has an additional role of directing the path by, for example, highlighting societal challenges that need to be addressed in the public innovation policies towards engaging the private sector in finding solutions – framed in the chapter as a pragmatic matrix approach of "picking the problems".

In parallel and interconnected to such changes in discourses, the concepts of shared value and public private partnership reveals a new stand on the traditional distinction between the private and public as two distinct spheres, each with different tasks. While PPP can be seen as an extension of the new public management approach towards privatisation and outsourcing, it does also imply a more cooperative and joint responsibility approach.

Departing from these emerging alterations in discourses, the chapter assessed the practices of the Carbon 20 municipalities in their preliminary efforts to pick up this renewed role of the public as driver for a targeted "growth engine" by finding solutions to societal challenges – here through the concept of green growth.

The overall regulatory framework and especially the municipality role, responsibilities and options are also addressed in chapter 8. Focus is explicitly on the boundaries of the practices of the municipalities and not so much to discuss the appropriateness of the overall regulatory framework as done in Chapter 6 and to some degree Chapter 7. The focus of chapter 8 has mainly been restricted to looking into and providing feedback on how municipalities can address this emerging new discourse of green growth within the given constituted framework – and thus not a critical feedback on the framework itself.

The reintroduction of the public and municipalities as drivers for (local) business development and innovation, and the concept of shared responsibility and PPP clearly cut across several traditional municipal borders and policy fields, whereas the framework relevant to encompass in the analysis is equally enlarged. This governmental arena is thereby already representing an emerging merging of several traditional rather distinct sub-arenas.

The municipalities have within the past 10 years been granted extended formal competences and responsibilities in respect of business support policies. These extended responsibilities were a specific element in a wider administrative reform in Denmark, where the municipalities were enlarged as units and reduced in numbers (from 271 to 98). The former counties were closed and most of their competences provided either to the enlarged municipalities, the state, or to a new

administrative level, the regions. The municipalities were, however, solely provided some of the formal competences in respect of business development, whereas the regions were also given a significant say in overall regional development strategy including prioritisation of EU and national available funding, while the state still set the overall directions. This means that the business development and support infrastructure calls for a high degree of coordination and collaboration between diverse actors across several governmental vertical levels, but also with specific responsibilities to consult and involve several other non-governmental organisations and thus specifically what is termed as networked governance.

Some of the reasoning for the administrative reform rest on the NPM inspired belief that creating bigger units would allow for increased efficiency, not least by allowing bigger purchasing orders and better options for the use of private companies to perform the various services through outsourcing and privatisation.

In parallel with the preparation of the reform, the government also prepared various guidance materials on how to apply public private partnerships (PPP) emphasising also innovation. The introduction of PPP and increased focus on innovation marks an enlargement of the previous New Public Management perspective of outsourcing and privatisation as well as the previous narrow interpretation of the EU public tendering framework. Recently the EU regulatory framework on public purchasing and tendering has been altered significantly. The core of this altering has been to emphasise the use of public procurement and tendering actively to promote the desirable societal objectives including explicitly promoting various public private partnerships constellations and technology procurement.

Acting upon this significantly altered public administrative landscape; several municipalities have reorganised internally and restructured the administration centred on placing this new business perspective as top political focus. Similarly, the reform and new organisation of tasks calls for extended cooperation among several different partners including the neighbouring municipalities, the regions, the various business interest groups and other stakeholders with a specific interest in this overall field.

The core of chapter 8 was to analyse the practices of the seven municipalities in Carbon 20 in respect to how they begin to use their extended formal competences and responsibilities in the business support arena as base for redefining and restructuring their interactions with companies – here in respect of green growth.

Based on many constructive discussions and input during a specific organised exchange of experiences, as well as other experience of Carbon 20 in general, some overall recommendations regarding the way municipalities can organise and stimulate the goal of green growth in cooperation between businesses and the municipalities were formulated:

1. Implement a business strategy that cuts across internal sectors in the municipality as well as reaches out to networking and partnering with relevant companies and stakeholders hereunder universities and knowledge institutions.
2. Use the future challenges of the municipality as point of departure for establishing a business strategy including commitments towards the climate and sustainability agenda
3. Apply the skills of (local) knowledge, research and educational institutions both in terms of (re) education, but also as partners in innovation projects
4. Offer the municipality as a Living Lab for companies, universities, etc. to test their latest products, technologies and research ideas
5. Networking and cooperation across the municipalities, both internally and externally
    a. Create an internal network across departments with both technical and environmental administration, business departments, job centers and procurement office, etc.
    b. Develop the inspection and other interactions with the companies to function as platform for promoting the municipality agenda e.g. green transition of local businesses. This implies increased coordination and internal mutual learning among e.g. the traditional environmental inspection role, business support role and officers focused on finding jobs for unemployed etc.
    c. Knowledge sharing across sectors and municipal boundaries – use of IT to make this SMART
6. Internal organization in relation to green, innovative procurement
    a. Exchange of experiences across municipalities including various units on green procurement and supply, PPP and PPI by joining the existing national networks like the Forum for Sustainable Procurement and Partnership for Green Public Procurement or establish a new network across the Green City municipalities
    b. Secure proper procedures and interactions among the different departments to secure that all relevant criteria are addressed in tendering
7. Create a common consensus and commitment in terms of sharing the good results, both internally and externally in the municipality in respect to get the politicians to get ownership to the environmental improvements and to let them tell the good stories
8. Act collectively together with the other municipalities in the region as well as the Region themselves to strive for an overall (business) development strategy that address green growth and other societal strategic challenges including also directing the business support services of the Growth Houses towards emphasising such aspects.

The recommendations are generally based on a variety of organisations and contexts of the municipalities. The specific choice of instruments, organisation, etc. depends on how the work in the municipality is already organised. What works in one municipality does not necessarily works in others.

11.5. THE COMPETENCE AND LEARNING OF THE MUNICIPAL OFFICERS

The learning perspective relates to the municipal officers adaptation of practises to improve their governability to influence a change among the local companies in respect to reduce GHG emissions, and presented and discussed in chapter 9 and 10 of this PhD.

Chapter 9 is the first step into providing input for the municipalities emerging altering of practises. The focus has been to analyse the officers learning during the Carbon 20 project in respect to their competences to influence the companies.

The essential of chapter 9 is also a paper submitted for publication. The paper depart from the same ”energy gap” literature as chapter 5, but found that this literature tradition pays no – or very limited – attention to the needed capabilities of the municipality (or other) to facilitate the companies to overcome the identified barriers. Experiences from other fields related to discussion of “change agent” and “organisational learning” are in the chapter therefore conveyed into the field of energy-efficiency and GHG emission reductions. The paper added to this literature by analysing the different competence activities of the Carbon 20 project and especially the introducing of the term “reflective dialogue partner” as framing for engaging the municipal officers in a collective reflexive reflection on their deutero-learning.

The participating officers from the seven municipalities entered the project with different past experiences and understandings about their role; resembling traditional change agent distinction between expert versus process consultants. The competence activities in the project were arranged to adaptively accommodate these different wishes for what skills to focus on, but also to challenge such preliminary perceptions of the needed skills. It was further decided to use the competence development sessions as platforms for consecutive collectively reflections on the different gained experiences and practices during the project.

The Carbon 20 competence development activities followed three tracks:

1) Competence development within methodological, technical and managerial areas channelled through so-called competence days with speakers from municipalities, universities and external advisors from e.g. energy consultants.

2) Knowledge sharing between the municipalities in a facilitated process – also at competence-days, but also project meetings and working group meetings on specific areas (including transport)
3) Competence development through participation in on-the-job training – e.g. that the municipal officers participate in the energy consultants screenings of the participating local companies.

As response to the varies discussions of the role and needed skills and competences of the municipal officers the concept of a "reflective dialogue partner" were introduced as framing for taking these discussion further into a collective reflexive reflections. Inspired by Broberg and Hermunds concept of "reflective political navigator", the "reflective dialogue partner" was termed as capable of adjusting strategy and approach to fit the interest and mentality of the company in question. This means that the officers need to: possess basic knowledge and insight into available (technical) solutions, be able to spot overall gaps in current energy performance, be able to listen and understand the situation of the company in question, and know where to direct the company for the available solutions. The latter also involve capabilities to spot and facilitate the establishment of suitable constellations that are attractive for different SMEs.

In responses to the final qualitative questionnaire the officers did highlights that the project in general have contributed to enhance the competences to engage and influence companies on the energy and climate agenda. Several do point at element included in the concept of "reflective dialogue partner" without referring specifically to this term, while however some also specifically makes references to this concept and emphasis that this is attempted to be taking up in the day-to-day interaction with companies e.g. during inspection activities.

11.6. ADAPTATION OF MUNICIPAL PRACTISES ACROSS THE THREE ARENAS

Chapter 10 furthered the learning perspective commenced in chapter 9 in respect to altering of practises to improve the municipalities' governability to match the complexity of the targeted system to be governed. As explained, chapter 10 has compiled the findings from the previous five chapters as an extension of the leaning and competence discussed above.

Chapter 5 looked into the subsystems (companies) to be governed, chapter 6, 7 and 8 analysed the governmental system itself in terms of the regimes of practices, discourses and constituted regulatory framework within distinct different (but merging) arenas, and chapter 9 looked into the learning and competences of the municipal officers. Chapter 10 extended the insights from all of these previous chapters into a specific assessment of how the reflective dialogue partner can influence local companies on the climate change agenda. The chapter specifically

looked at, which of the means and governing techniques across the tree arenas are suitable to address the encountered challenges of the companies.

Chapter 10 thereby presented suggestions for which competences, means and techniques to apply in a new regime of practise capable of improving the governability across the merging arenas. Chapter 10 is thereby a preliminary conclusion on the overall research question in terms how – especially the municipal officer – can influence companies to lower their GHG emissions. As argued in chapter 4, these preliminary conclusions on the competences, means and techniques that the officer can apply is taken up (in chapter 12) on the municipal organisational level by presenting a generic model of components to include in a municipal strategy for how to influence companies on the climate change mitigation agenda.

With the point of departure in the diversified challenges highlighted in chapter 5 and Table 3; the means and competences highlighted in chapter 10 were:

- A frequent and persistent follow-up to keep the focus on the agenda,
- Ensure interest in the general business situation of the companies and navigate to align the energy saving and climate agenda to fit into what triggers their enthusiasm - whether it is technical possibilities, specific saving potentials, external exposure, CSR, funding possibilities etc.
- Be adaptive in the applied strategy in respect to the companies' challenges – including e.g. altering who handle the dialogue if this will help
- Be able to spot potentials for the good stories and capable of selling those to the press and/or creating stories for the web and social media
- Be prepared to drop or use more firm means for affecting reluctant companies – e.g. using the possibilities to address energy in environmental permits, etc.
- Use the positive processes as outset for an even broader focus on e.g. resource efficiency, industrial symbiosis, ecodesign, supply chain, green business models, cradle2cradle.
- Organise and steer various network activities and sessions on various topics of interest to the companies.
- Be able to find different settings for involving external actors that can add to the process and see possibilities for establishing a business case – e.g.
    - Energy utilities and their consultants,
    - Equipment suppliers,
    - Electricians and other craftsmen that are the ones facilitating or implementing the solutions;
    - Banks or other financial institutes in terms of bringing in the financial solutions
    - Consultants etc. specialised in e.g. the dwelling sector
    - Knowledge - and educational institutions

- Challenge external consultants to adjust their services to include the whole package of finding solutions, bring in finance and advice implementation – also in respect to the challenges specific for small companies,
- Be able to initiate and mediate dialogue between different actors for implementing the proper solutions – e.g. between tenants and their landlords (also if municipality itself) as well as others actors such a conservation body or between neighbouring companies and/or district heating supplier in respect to reutilisations of excess heat etc.
- Act internally across administrative and organisational boundaries to activate internal resources and capabilities and combine different municipal agendas – e.g.
    - The "jobcentre" in respect to re-educate unemployed workforces to function as trainee in the companies etc.
    - Internal energy optimisation unit to provide assessments at companies
    - The property administration in terms of affecting, how the municipality act as landlord
    - The procurement units in terms of establishing procedures for environmental requirements to companies and innovative involvement in the municipalities tendering and procurements, or even for how to engage companies in specific PPP or PPI projects
    - Business support unit in terms of finding synergies between the business and environmental perspectives in terms of finding potentials for new business opportunities on the green agenda, as well as provide insight into the various funding opportunities etc.
    - The building approval units in terms of informing and/or requiring high energy standards
- Navigate politically in respect to get both administrative as well as political attention, focus and backing on various topics
- Provide feedback to and/or activate the political system about conceived challenges that need change in the overall regulatory frames or a broader dissemination of possible ways to address them.
- Spot potentials for joint collaboration and partnering on development and testing of innovative solutions to municipal challenges

CHAPTER 12. A GENERIC “MODEL” FOR A MUNICIPAL STRATEGY

A number of the competences and means that the environmental officers in the municipality can apply to influence the local companies on this climate mitigation agenda were listed in chapter 10. This list already forms some preliminary answering on the overall research question – albeit narrowly in terms of the competences needed by the environmental officers. This chapter takes a different framing on the overall research problems by bringing it up on the municipal level. The chapter is a presenting of a conceptual model for how municipalities can influence companies to reduce their GHG emissions.

As the list in chapter 10 indicates, the suggested competencies and means encompasses a huge diversity extending the ability of the single officers and thereby pointing at a need for increased cooperation between several actors: internally within the environmental team(s), across municipal boundaries and other municipal units, as well as externally with other stakeholders. Several of the means and competence highlighted in chapter 10 further depart significantly from current practises and thus properly need political and administrative backing to be realised.

All this point at a necessity of bringing the agenda up on the municipality level – and not solely a matter of the competences of the municipal officer – in terms of a specific municipal strategy for how to organise and conduct this influence on the local companies.

A specific element in Carbon 20 was to address, how to continue the agenda after the end of the project including how to integrate the experiences and knowledge obtained into everyday practice. In prolongation of having office space in Allerød municipality, I became involved in their internal work to prepare the continuation of the project. As part of this I prepared and presented a concept of generic components that the municipality could successively chose to implement. Each step requires a stronger engagement and resource allocation from the municipality.

I have subsequently also presented the components for several of the other participating municipalities, when discussing their continuation after Carbon 20 as well as at a final arrangement for the involved key persons of the project.

Based on feedback and discussions following these presentations, I have elaborated and extended the concept into a generic model of four core components to include in a municipal strategy.

The four components are:

1. Address energy and GHG reduction etc. as an element in or extension of the direct regulation of companies and potentially also during other such (authority) interactions with companies, for example, building and construction approval
2. Cooperate with others – external and/or internal – to establish prober facilitation "offers" for the different types of companies – this may imply finding different solutions for the different companies
3. Facilitate specific networking and a continuous exchange of experience and knowledge among the companies
4. Get the municipality to address energy, GHG and business development strategically as an element in several of its overall policies and focuses

12.1. FIRST COMPONENT – PART OF AUTHORITY INTERACTION WITH COMPANIES

The Carbon 20 has in most municipalities been anchored in the environmental department and more specifically the unit responsible for the direct regulation of companies. A first component can thus be to adopt the energy and GHG reduction agenda as something to address during this interactions with the companies.

As presented in Chapter 6, there are indeed possibilities for addressing energy, climate change, resources, cleaner technologies and pollution prevention as part of the municipalities executing of the environmental regulation of companies. This concerns both as a catalyst role, but also as part of the authority role – albeit some uncertainty on the legal still remain calling for further clarification regarding especially the group of companies under the jurisdictions of the municipalities.

In addition to addressing specific energy, resource and GHG reductions related to on-site production and/or buildings such broader dialogue can – depending of course on the type and attitude of the company in question – also be enlarged to address broader innovative aspects including spotting possibilities for symbioses among companies and promoting Cradle2Cradle ideas. This latter will – in contrast – most likely be restricted to a catalytic role.

While there are possibilities within the regulatory framework, it does significantly deviate from how the direct environmental regulations of companies have been practiced. As such it will probably require a re-education of the local inspection officers in respect to the catalyst role and enable them to act as a reflective dialogue partner. Similarly it will also require reorientation of focus, prioritisation, and possibly also resources.

In extension of this widening of the environmental authority role in terms of providing more guidance on energy etc., similar approaches can also be integrated in other authority roles.

Municipalities in Denmark are e.g. authorities in terms of approval of building and construction projects. Most of the participating municipalities include requirements for energy efficiency; utilising the increased possibilities for that within the building regulations and the building directives introduction of both minimum levels and more ambitious levels. On top of this, there are also possibilities for promoting the concept of energy efficient design for larger building projects or other attempts to encourage applicants to integrate energy and resource efficiencies in new projects – ahead of requirements.

In addition municipalities have other interactions in which it could be possible to promote energy savings and GHG emission reduction targets e.g. recent responsibility to offer business support (either themselves or together with partners) as well as the jobcentre's active attempt to get companies to take in trainees etc.

Equally to the inspection field, this is something that requires specific municipal focus to be prioritised.

12.2. SECOND COMPONENT – ESTABLISH DIFFERENT "OFFERS" FOR THE COMPANIES

A central element in the Carbon 20 project was to establish and try out a specific set-up for providing an "offer" to the companies to motivate them to participate and make voluntary efforts to reduce their emissions.

A central element in that "offer" was a screening free of charge for the companies. The opportunity to make such offers to the companies derived from a specific cooperation with energy consultants from both energy utilities and equipment manufacturers interested in the energy service field (ESCO). The energy utilities' interest in this cooperation is linked to the existence of a national EEO scheme that obliges them to find savings for end-users (households and business), but also allows them to establish a white certificate market for such savings.

In Chapter 7 several constraints for the particular set-up of the offer in the Carbon 20 project were highlighted. It was however also stressed that most of the engaged energy consultants were interested in finding ways to continue the corporation in spite of these, but that some adjustment would be needed to assure a proper business models for all involved partners.

There seem to be possibilities for establishing and/or continuing corporation with the energy consultants to engage in screenings of local companies. As shown such

possibilities seem more promising for the larger companies, whereas the smallest are generally judged to possess little saving potential compared to the resources required for such savings. The energy utilities seemed interested in contributing to finding different ways around this, and some are involved in different attempts to find a proper business model for targeting the smallest companies in current succeeding projects.

Throughout this project, municipalities have considered different arrangements to address small companies including engaging: electricians and/or other craftsmen; actors specialising in providing a integrated solution of both highlighting saving potential, financing suggestions and craftsmen to implement the solutions for households; interns or student employees to carry out the screenings; local education institutions to integrate screenings as focus for the teaching; as well as the jobcentres in specific re-education of the unemployed to address companies in respect of energy savings.

Several municipalities have had a strong focus on internal energy savings for a long time. Depending on the specific approaches applied and the status of such project(s) there might even be potential in re-orientating officers from such areas towards external facilitation.

While the screenings were considered central for the companies' engagement, there are potentially also other valuable "offers" that can be established.

As seen in chapter 5, the capital needed for investment was considered a significant challenge for several companies. While financing wasn't addressed specifically during the Carbon 20 project, several other actors are cooperating with banks and other financial institutions in finding attractive solutions. Some equipment providers also provide options to pay for the equipment over a longer period in respect of the saved cost resulting from the energy savings. The municipality could engage in that and distribute such possibilities.

Allerød managed to make a deal with the local media to bring a story from every participating company about their achievements. Allerød used this actively as an asset in their engagement strategy towards companies, and pointed out that it clearly did motivate the companies.

The municipalities cooperated with AAU, and other knowledge institutions, in respect of broadening the perspectives from solely energy savings towards also looking at innovation, products, supply chains, food and transport etc. The parallel Network for Business Development (NBE) has specifically also engaged business support units to bring in business perspectives and knowledge of the various support schemes.

A second component in the municipal effort to encourage local companies is thus to map and enters agreements with the external and internal actors that could add specific additional elements towards offering facilitation to the local companies.

External actors could for example be:

- Energy consultants from energy utilities, energy service companies, equipment manufactures etc.
- Electricians and other craftsman
- Educational institutions
- Universities and other knowledge institutions in relevant fields
- Banks and financial institutions
- Local media

Internal actors in the municipality could involve:

- Business support actors (internal or the used external providers, and specialised unit)
- Jobcentres
- Internal building administration

This ability to cooperate internally and externally were also highlighted as central element in chapter 10 concerning o the municipal officer level. Again such competences deviate significantly from traditional focus and competences, as well as imply working across municipal units, which all calling for a more conscious municipal strategy and backing.

12.3. THIRD COMPONENT – DRIVE A NETWORK

Throughout the Carbon 20 project various "network" activities targeting the participating companies were arranged both locally within the single municipality and across the seven municipalities varying in focus and scope from a specific exchange of experiences among the participating companies, distributing specific knowledge and inspiration, and workshops on specific topics – some only targeting the participating company, while others were open to other interested companies (see e.g. Gate 21, n.d.-e).

In the 1990s, several municipalities were already involved in similar public-driven environmental networks for companies – often orchestrated by the former counties across neighbouring municipalities. After the administrative reform some managed to continue with a collaboration of the enlarged municipalities as those organising the network, while others were transformed into business networks. Several other Danish municipalities have, simultaneously with the Carbon 20 project, also been starting local public-private business networks on the climate agenda.

Some experience from the Carbon 20 project suggest that it can indeed be a rather time-consuming task to get companies committed and interested in participating in such activities, as there are plenty of networks "competing" for the companies' time. However, it also showed that the participating companies often gained a great benefit from the arrangement – not just in respect of gaining inspiration, but furthermore as motivation to present their results. One of the most significant requirements is to have a critical mass of interested companies.

There are plenty of different ways to organise such networks. The mentioned environmental networks formed during the 1990s, all built on membership, where companies and municipalities pay a membership fee and in return receive assistance to implement an environmental management scheme. Focus of these schemes was primary the larger production site also subject for permit and inspection and therefore with the municipal and counties environmental officers involved as central actors to disseminate and facilitate these EMS.

Several of the newer municipality driven climate "networks" have a much looser structure in terms of different arrangements open for all and covering both production companies subject for permits and inspection as well as other smaller companies. Some have made intermediate models, where some arrangements are limited for the companies having committed themselves to internal reductions while others is kept open for all without any commitments. The scope also various significantly: from focus mainly on disseminating the good examples and/or other information and knowledge, over specific forums for more in-depth exchange of experiences, to platforms for formulating specific joint project – for example EU projects.

During the Carbon 20 project, some officers explained that the direct one-to-one facilitating was often rather resource demanding, but conversely also considered central to the continued focus of the companies. Most argued that this follow up could be integrated into inspection activities in several of cases, however numerous smaller companies are not included in this. As mentioned, several hope to find a model through cooperation with various other actors that also include components of this follow-up facilitation. There were further expressed some thoughts that the forming of more specific network activities could be used actively as follow-up instead of this direct one-to-one interaction – utilising the experiences that it had succeeded to get companies ahead by committing them to present their results.

Some Carbon 20 municipalities see networks on the climate and sustainability agenda as the basis (re-orientation of former business forum) for an active forum for consulting business perspectives during local policy formulating processes. This is a change from solely dissemination of information towards a two-way forum in terms of also obtaining feedback from engaged and committed local companies.

One municipality specifically engaged the local business organisation to arrange network facilitation among the companies on the climate agenda. The business organisation already has been distributed responsibilities of the local business general support unit from the municipality. In prolongation of this cooperation, the municipality and business organisation set up a specific cooperation about the Carbon 20 project in terms of e.g. preparation of specific network activities.

A third component to consider is thus whether and how to organise more common network activities among the local companies adhering to the green agenda. It could even be considered if there would be additional value in making collaboration with neighbouring municipalities and/or engage the business support units, the Growth Houses or even the Regions actively to orchestra the network. While the environmental officers may have some possibilities for organising some ad hoc arrangement, they will need municipal support to make it a more continual focus.

12.4. FOURTH COMPONENT – INTEGRATION AS A STRATEGIC TOPIC FOR THE MUNICIPALITY

The participating municipalities are all part of "green cities" and have adopted ambitious climate action plans as a core policy objective. Several are commencing to connect this agenda to a green growth and business development strategy, integrating both climate change and other societal challenges, and business development as core strategic perspectives for several of the municipality functions. This includes a range of different possibilities as shown in chapter 8, such as:

- Targeting the business support scheme to offer guidance on the green agenda and in the clean tech field – both in respect of the support provided by the municipalities (or the partners they engage) and the joint municipal specialised support unit of Growth Houses
- Internal re-organisation of municipal task to make synergies – e.g. linking the jobcentres and environmental officers having the contact with the local companies
- Green (and CSR) public procurement in respect of creating a lead market for existing green products
- Incorporating green, social clauses and innovation elements into the tendering of both construction sites and services,
- Interring varies form of Public Private Partnerships and co-creative partnering on innovating new solutions in public private innovation and/or using the municipality as a test facility for new solutions – a living laboratory.

A fourth component could be to use this climate agenda as basis for a redefinition of municipal tasks and activities in terms of acting strategically to form various cooperation and partnering with local business in order to target green growth.

12.5. CONCLUSIONS ON THE MODEL

The four components of this "conceptual model" are here presented as separate, where the municipalities can place different emphasis on implementing different aspects of these components. They do however interact, whereas a strong attention to the fourth strategic component may entail reemphasis and enlargement of the previous components.

A possible agenda for the inspection of the companies could thus be enlarged even further in terms of also representing the municipality towards other agendas e.g. in recognising the potential for increased cooperation on specific topics such as employment, engaging in procurement procedures and/or as platform for spotting and entering joint innovation projects etc.

Similarly, network activities can move towards being a platform for increased cooperation between the municipality and companies – both in respect of feedback on policy initiatives and -formation, but also for closer cooperation on specific topics and used as partnering platforms to seek funding and/or participate in, for example, EU or nationally funded projects.

CHAPTER 13. CONCLUSIONS ON THE RESEARCH PERSPECTIVES

In extension of the last chapters conclusions on the different practical problems addressed, I now turn attention towards the twofold research interest derived from the methodological and epistemological discussions in chapter 2 (the scientific problems related with the practical problems) in terms of respectively a learning and governance perspective:

1) How can municipalities learn to be reflective dialogue partners; and
2) What are the governance frameworks for the ability of the municipalities to influence local companies on climate change mitigations?

As argued in chapter 2, both of these perspectives have a double element of

a. An immediate impact on the case and its contextual settings – my participatory contribution to influence and affect the case
b. A broader aim in terms of providing insight that could be of interest in a broader and/or different context – my third loop research perspective on the "exemplarity" of the case.

13.1. THE LEARNING PERSPECTIVE

The two core scientific interest to the practical research question relates to respective a learning- and a governance perspective. This paragraph addresses the learning perspective.

As outlined, this learning perspective concerns a twofold interest of:

a) The actual learning of the municipal officer participating in the Carbon 20 project in terms of how my engagement in the Carbon 20 project have added to their learning process (detouring learning) on becoming a reflective dialogue partner; and
b) The exemplarity of the learning and conclusions of this PhD as inspiration for others municipalities or others engaged in influencing companies to lower their GHG emissions.

THE MUNICIPALITIES (OFFICERS) LEARNING THROUGHOUT THE CARBON 20 PROJECT

The competence development of the participating municipal officers was as mentioned one of the prime objectives of the whole Carbon 20 project, reported separately (AAU, 2013c).

The competence development activities in the Carbon20 project included as highlighted in chapter 9 three tracks:

A. Specific training in the methodological, technical and managerial skills at several "competence days" with speakers from municipalities, universities and external advisors from, for example, energy utilities, energy consultants, and experts within the energy field.
B. Facilitated sharing of knowledge and experience between the municipal officers on, for example, the competence days, at project progress meetings and working group meetings on specific areas (such as transport)
C. Competence development through participation in on-the-job training, such as that of the municipal officers participating in energy consultant screenings of the companies, and Aalborg University's communication with companies on innovation etc.

As mentioned in chapter 9, AAU introduced the concept of the municipal officers acting as "reflective dialogue partners" as an outcome of the different discussions during the project, and as further frameworks for continuing such discussions of the role and competences of the municipal officers in their interactions with the companies – the officers' deutero-learning.

In my opinion there is no doubt that most of the participating municipality officers have undergone a competence journey. This is e.g. apparent in their altered view on the possibilities and options for continuing the approach after end of external funding. At the final stage of the project most of the officers expressed confidence (and even determination) that the work will continue in some way or another, even without new external funding, whereas the picture was quite the opposite at the beginning of the project.

Throughout the project various evaluations of the competence development activities were conducted as input for the continued preparation of the coming competence days. These generally showed that the officers were mostly content with the different activities. There was some difference of opinion in terms of which of the specific training elements had been relevant and useful, emphasising that the topics had mostly been relevant and added insight. Some would have preferred even more technical insight while others called for more emphasis on managerial and methodological skills. All the officers expressed the great value of

participation in on-the-job training, such as touring some of the participating companies together with the energy consultant. They emphasised that this hands-on practice into what was looked for has added great insight. Similarly there seemed to be generally high satisfaction with the various facilitated exchanges of knowledge and experiences in respect of mutual learning from the specific experiences of interactions with the companies. Again emphasis was put on this hands-on inspiration and discussions with colleagues as being central. In the final questionnaire several of the officers even expressed that element covered by this reflective practitioner will be integrated into the practises.

While some of the learning of the officers can be attributed specifically to these more targeted activities, learning took place throughout several of the activities in the project. As mentioned, the facilitated exchange of experiences attempted to create a link into this practical "learning by doing", or learning by practice. Similarly the introduction of the "reflective dialogue partner" was accompanied with specific questions to introduce in the dialogue with the companies to make both companies - but first and foremost the officers - reflect on their own practice. These questions were as mentioned followed up in the qualitative interviews of the second monitoring process and targeted specifically in the final qualitative questionnaire. These latter had the double (or triple) aim of both collecting data for the monitoring process – and my PhD research (a third aim) – but also explicitly to make the officers reflect on the process.

As a participant in the project I was strongly engaged in several of its aspects, among other partly involved in the competence development activities. I did e.g. participate in the planning and execution of several competence days and facilitated exchange of knowledge processes, especially in respect of activating the insight and input received from the various monitoring processes and interviews with the officers.

In the above conclusions from each of the chapters I have indicated some of the specific learning contributions.

Chapter 5 derived from a specific interest of the officers in collecting such information. The addressing of the challenges in both the interviews of the second monitoring and the questions of the third final monitoring have thus contributed to making the officers aware of the variety of different challenges, and have hopefully contributed to their reflection on what worked and what did not in respect of the different challenges.

The topic of chapter 6 was discussed on several occasions, where I constantly attempted to challenge the officers' immediate impressions about possibilities, task and constraints within the regulatory framework to more specifically address energy, climate change and other broader environmental concerns as part of the

direct regulation of companies. I believe that this constant questioning contributed to change the opinions of most of the participating officers about their actually possibilities. The discussions and subsequent the addressing of the topic in the PhD, furthermore resulted in a specific clarification by the Danish EPA, even though several uncertainties are still remaining.

Similarly I believe that the project in general – and especially the conclusions of chapter 7 – has contributed to a greater understanding among the participant officers, and also the energy consultants, about the strength and dilemmas of establishing cooperation and interlinks between local municipal programmes and the national EEO scheme. I even think that it has paved the way for a continuation of collaborations; at least in some of the municipalities and among some of the energy consultants, who were otherwise rather sceptical after their preliminary experiences.

The special attention given to the green growth track of the project (chapter 8) also contributed to expand the GHG agenda by highlighting potential synergies to other task. While several of the municipalities were well ahead in using this business focus strategically, this agenda was rather new to some of the municipalities. As the track also included officers from other units of the municipalities, this exercise contributed to creating links and new forums for such discussions across typical municipal arenas.

The suggested model presented above of different possible components to include in a municipal strategy was developed as input specifically for the municipalities, where I had office space for half a year. I believe that my engagement added specifically to enriching their process on the potential continuation of the project. The (draft) "model" and the insights forming chapter 9 and chapter 10 were further presented for several of the other municipalities. These discussions enriched my conceptualisations of the model, but also added to the municipalities understanding of possibilities and constraints as well as how to organise the task onwards.

The overall conclusion to this specific learning contribution of the PhD is therefore that the participant officers and other stakeholders learnt a great deal during the project – including myself as researcher; the third loop learning. Not all can be attributed to specific activities and the steered competence development track of the projects; it also derived from continuous interactions with companies in general and other specific partners. I believe that I have made a contribution to some of the learning in terms of both involvements in the planning and execution of the competence development activities, the specific interactions during the monitoring processes and as participant in several of the other Carbon 20 activities. The precise elements of my contributions are difficult to distinguish, however.

WHAT LEARNING CAN BE OF INTEREST FOR OTHERS

As seen above the combined approach of integrating a variety of different competence development activities were judged important from the officers' perspective in terms of particularly highlighting the activities that had a hands-on practical on-the-job training and the facilitated exchange of experiences and knowledge from the specific interactions with companies. The central overall "triple loop" learning from this project is thus a confirmation that project targeting to enhance the deutero-learning of practitioners needs to incorporate a practical and hands-on "learning by doing" element in any competence development activities.

In addition to this overall learning conclusion, I believe that the project – and this PhD – has contributed many different insights and much knowledge that can indeed be of relevance and value for other municipalities (and even other second part facilitation programs) wishing to commence or extend their activities in this field.

In the methodology in Chapter 2 and the section concerning case studies, I argued that the Carbon 20 project as a case was extreme/deviant in terms of both the capacity to conduct such EU projects and the fact that they collaborated in the Green City forum. While this naturally means that the case is far from representative, the point is that such cases can add valuable insight that can function as learning examples for others – or even set the scene and thus become a paradigmatic case to follow.

I further showed that the Carbon 20 project was actually made up of seven cases providing variation in terms of including quite different municipalities. The variations were as mentioned not addressed consequently throughout the project and in this thesis. It does, however, imply that all the insight and conclusions are based on a variety of experiences from different contexts. The conclusion drawn is therefore already encompasses a huge flexibility in terms of its reach. This means that it is possible for other municipalities to select those elements and insights that could be relevant to them to adapt for their specific context, while leaving out aspects that may be out of their scope.

As also argued in the methodological chapter it is in principal up to the reader to judge, which elements can be of relevance to them, where I as the author attempt to make the basis for their judgement clear by outlining the foundation for the drawn conclusions. I will, however, here make some outlining of the elements that I believe also have relevance for others in similar situations.

In the project several different templates were prepared and the final reporting of the project also specifically provides guidance for others on which and how these can be of relevance. I will not repeat them here, but concentrate on the contributions of this PhD thesis, including the various core chapters and papers. There will of

course be overlap, but I do not as such address the templates and other Carbon 20 materials developed.

I argued above that the topic addressed in the chapters had contributed to the learning of the participants in their development/exploration of these topics. Similarly the results/findings from these processes could form inspiration for others. It seems plausible that other municipalities' can have value of insights related to among others:

- That SMEs are different and act differently even in similar settings, resulting in quite diverse situations and challenges that call for an adaptive approach
- That some of the challenges will probably relate to those highlighted in Paper 1, whereas a preparation to address such seems appropriate; But also that the actual challenges may appear different and also include other challenges depending on the specifics of the participating companies,
- That there is some flexibility to address energy, GHG, pollution prevention etc. as elements in the direct environmental regulation of companies
- That there are possibilities for engaging and collaborating with energy consultants at no (or reduced) cost using this EEO scheme, but also that the organisation needs to acknowledge that a proper business model needs to be established for the energy consultants
- The concept of "reflective Dialogue partner" as well as the specific listening in chapter 10 of the possible competences, skills and methods to bring into play when engaging to influence a change among the local companies
- The model of the gradually expanded possible elements to include in a municipal strategy to influence the local companies.

13.2. THE GOVERNANCE PERSPECTIVE

Similarly to the learning perspective, the governance perspective also includes a twofold focus:

a) The immediate feedback concerning the particular case and especially the context of that case – the potential impact of the PhD in respect to the Danish constituted regulatory framework, and
b) The more academic discussions about the role of the municipalities within the governance of climate change mitigating – not in respect of generating overall "ideal theory" on how to govern local companies, but to provide some insight from the particular case that adds to the overall academic discussions.

POTENTIAL IMPACT ON THE DANISH REGULATORY FRAMEWORK

As outlined in the methodology, I combine a learning perspective with a critical governance perspective. This latter imply that I take a critical look at the appropriateness of the current regulatory framework and the drawn boundaries for the practices of the officers. As outlined in Chapter 3, the Chapters of 6, 7 and 8 in particular took a closer look at the regulatory framework in light of both the overall discourses and actual practices in the three governmental arenas of environmental regulation, Energy Efficiency and business development. As indicated in the last subchapter, chapter 6 and 7 in particular added critical perspectives on the current regulatory framework, whereas chapter 8 predominantly only outlined the overall institutional boundaries for the emerging municipal attempt to act across such in respect to the green growth discourse.

The critical contributions to the overall Danish framework are thus mainly about:

1. The framework for direct environmental regulation of companies, which is a blurred mixture of various different discourses that fails to provide a clear direction for actual execution. This calls for both specific alteration of the actual legal text, and at least some more proper guidance
2. The current EEO scheme, which fails to provide incentives to target the smallest companies, and furthermore show rather low additionality for the realised savings.

In relation to the first issue on the Danish Regulatory framework for the direct regulation of companies, Chapter 6 highlighted an implementation gap between overall discursive understanding of the regulatory approach and the actual practices of the municipalities, and showed several constraints and possibilities for improvement within the regulatory set-up.

As these findings derived partly from interviews with the officers of municipalities that have committed themselves to the green agenda (Green Cities) it would be reasonable to presume that the constraints highlighted by them also apply more generally across Danish municipalities. The Carbon 20 project is here thus functions as a critical case in respect of the overall Danish regulatory framework and thereby underscoring the need for both specific alteration and at minimum more clarification and guidance on the topic.

The Danish EPA has contributed with some clarity during this project, although it didn't cover all situations. More clear and formal guidance is thus still needed including (at minimum) to distribute the (restricted) clarification provided in relation to this project to all municipalities.

Given that an objective is that local authorities should play an active role in facilitating companies to address pollution presentation before enforcing end-of-pipe solutions (even if such are not locally prioritised), there seems to be a need for specific alterations to the framework as well. This could (at a minimum) include underscoring the catalyst role as a required element of inspection activities rather than as something additional. It should further imply an alteration of some of the wording about BAT in the simplified permit scheme so that municipalities contrary to now are explicit provided the possibility to address energy, resources, pollution prevention etc. in their interaction with these companies. As it is formulated now, their options are depending on the dialogue on BAT, which however in many cases are to be defined by overall national sectorial stipulations and orders. It could further be to name such aspects specifically in the clause of the Permitting Order suggesting with parameters to include in permits as the officers seems to use the listing in that clause as directional for their focus – even in their more catalytic interaction.

As mentioned there is currently some pressure to start a comprehensive rewriting of the regulatory framework, making it more closely aligned with the EU regulatory set-up, where these suggestions could be included.

In relation to the second aspect of the national energy efficiency obligation scheme for the utilities, chapter 7 highlighted the fact that the latest evaluations of the EEO scheme included – if read critically – two serious critiques of the scheme that call for a change in the set-up (however, formulated rather weak) – namely that:

- The reported savings seems to be overestimated compared to actual realised savings, and
- The additionality of the energy savings implemented due to the scheme is quite low

As mentioned Chapter 7 found that focus within the EEO scheme has particularly been on the bigger companies. This includes the bigger Danish companies such as Grundfos, who have a well-established internal EMS (even EMAS) and include energy efficiency as a core feature of its main product – energy efficient pumps. The inclusion of savings by Grundfos etc. adds to the picture of cost-efficient savings, as such savings can be realised at a relatively low administrative cost compared to smaller companies. The additionality of such savings seems, however, more questionable as Grundfos and the like presumably have the capacity to find and realise such savings without the added incitement from such scheme.

The "new" EU directive on energy efficiency furthermore adds to lower the additionality. The directive commands the biggest companies to have their site energy screened periodically. In my view – and similarly also in the view of LGDK – this calls for modification of the scheme, as most of the largest companies are

thus addressed through legal obligations. The added value of targeting them through the EEO scheme seems thereby limited. So far this altering of the EU framework has not led to any changes in the Danish EEO scheme. Seemingly such obligatory screenings can still be counted as part of the EEO scheme.

In Denmark the requirement to conduct screenings is implemented trough an obligation of the companies in question to report to Danish Energy Agency, who than can make some samples. An alternative (supplementary) implementation could be to integrate such into the direct environmental regulation of companies, so that the environmental officers also specifically shall address this during permitting and inspection – and thus integrated into the discussion of the direct environmental regulation.

CONTRIBUTIONS TO THE DISCUSSION ON LOCAL GOVERNMENTS ROLE IN GOVERNANCE OF CLIMATE CHANGE MITIGATION

In Chapter 1, I noted that the research field; the academic debate that I positioned myself in respect to, is the increasing focus on local government role in the governance of climate change. I further noted that I took a rather narrow perspective on this agenda in respect of how the municipalities (local government) attempt to influence local companies on the mitigating agenda in contrast to including also the municipalities internal activities and activities targeted citizens as well as adaptations measures.

Most existing literature on the local government governance role in climate change has included both mitigation and adaptation. Equally the literature has showed interest in the variety of actions that local government are taking including: their internal activities (what Bulkeley and Kerns (2006) term *self-governing)*, their services (*governing by provision*), and influencing action by others using either regulation (*governing by authority*) and/or facilitating and encouraging (*governing through enabling*), showing also that the majority of the action so far has concentrated on the self-governing in terms of looking at the municipalities directly controlled emissions as institutions.

Contrary to this, my focus in this PhD thesis is on the influencing placed on local companies to take action on the mitigation. The PhD is empirical based on the Carbon 20 project, which is centred on a voluntary "partnership" agreement with companies. The point of departure for this PhD is thus this "governing through enabling" of others, where "the others" are local companies. I do however take a more specific look at the variety of governing modes that local government can apply including elements of the rest of Bulkeley and Kern's governing modes – restricted, however, to their relationship with local companies. For my purpose I therefore instead turned to Kooimann and Foucault's terminology, taking the point

of departure in a variety of means (governing techniques) to encourage and influence others.

The more narrowly focus at improving the governability of local government (municipalities) in respect to a range of different activities has, as shown above, touched upon a range of different, but interrelated, scientific debates related to both the focus on the three environmental arenas (regulation of companies; the EEO Scheme; and business support and green growth); but also in assessment of the specifically encountered challenges for business implementation of energy savings, as well as the municipality learning to be change agents.

This section takes a closer look at the potential academic insight to be gained from this PhD. It takes a specific look at the academic contributions of the core chapter 5-10 and than more generally discusses the role of local authorities in the governance of climate change and related environmental concerns.

In relation to chapter 5, several studies have highlighted different barriers and challenges for company implementation of energy saving in different settings. The paper adds to this existing knowledge by applying a different method; relying on qualitative second hand statements from the municipalities rather than the companies' own range of predefined barriers. As mentioned the paper confirm earlier contributions that "lack of time and priority" and "economic challenges" are indeed some of the challenges most highlighted by SMEs under a setting of providing initial screening for free. As the paper is based on different methods and approaches, the paper qualifies such finding. The paper showed however also that these related overall challenges had apparent differences that specifically affect how to approach companies encountering such challenges. The paper thereby add to broaden the academic understanding of such challenges and barriers in terms of empirically highlighting that company situations are very diverse and that any policies to target them therefore also need to be adaptive or broad in order to influence quite different situations. This finding align the insight from Kooiman's approach to governance, where the system to be governed is view as complex and dynamic as well as with huge variations. The paper adds to this by specifying this into the context of the Energy efficiency and companies.

Chapter 6 specifically highlighted an implementation gap between the overall discourses of the environmental regulation of companies and the actual execution (practices) by specific local (competent) authorities. As argued above, these local authorities were to be considered a critical case in relation to the Danish context due to their commitment to common environmental goals in the Green City scheme. Similarly Denmark has – at least around the millennium – been viewed as ambitious in the environmental field. The highlighted implementation gap may thereby be regarded as a critical case even in respect of the general academic discourse about environmental regulation being geared quite as much towards

pollution prevention as is often presented – also in the international academic debate. The article thereby not only provides a critically perspectives and feedback towards the Danish regulatory framework, but also provide an empirically contesting of the overall discursive representation.

Similarly, Chapter 7 found that the Danish implementation of an EEO scheme has limitations in respect of the otherwise proclaimed assets of such schemes. The paper highlighted that the Danish scheme provides little incentive for addressing the smallest companies, and further that the scheme showed rather low additionality of the realised savings. The paper adds a critical dimension to the academic and political discussions of such EEO and White Certificate schemes, that otherwise is dominated by more or less reasoned economic discourses and assumptions on the prospect of such schemes. Similar to chapter 6, the Danish EEO has actually been seen as an example to follow e.g. up to the negotiations on the EU energy efficiency directive requiring all member states to implement such EEO schemes. The paper thus equally forms a critical case by highlighting some of the shortcomings in a scheme otherwise considered state-of-the art. The paper adds to a growing understanding that the (potential) value of such schemes is highly dependent on the specific organisation, including the definition of how to measure the success of the scheme. Similarly for the local government to utilise such schemes necessitates a closer look at the specific organisation and incentives provided so as to agree on proper business models for all partners within the specific schemes.

Chapter 8 looked at the municipalities practises related to business support and green growth. The chapter is a local government perspective contribution to the re-introduction of the public as driver for business support and growth towards innovating new solutions to societal grand challenges – named in this PhD as a new pragmatic matrix strategy of "picking the problems". The chapter has shown how the seven local municipalities have begun to develop an interactive and cooperative approach to the companies by engaging, encouraging, collaborating and entering into partnership with the local business sector. The chapter looks specifically at the emerging altering of municipal practises within and across six previous rather district sub-arenas. The paper show how this emerging merging of the practises on this pragmatic matrix approach feed into several previous distinct academic discussions by linking the diverse literature of: public policies on business and regional development, innovation dynamics, public administration and public private partnership. The chapter has shown how the discussions within each of these are beginning to point at similar trends using, however, different wordings, concepts and understandings. The chapter brings these together and add the local level practical perspective.

Chapter 9 relates to the academic discussions about different roles and competences for external change agents attempting to endorse specific changes among companies. It add to the literature focused on broadening such roles from the

traditional distinction between experts vs. process consultants by adapting the concept of "reflective political navigator" to a "reflective dialogue partner" in the context of facilitating companies to address energy and climate change mitigation. It equally adds to the related discussions on learning by specifically evaluation the competence development activities of the Carbon 20 project and the learning obtained. It is concluded that competence development and learning tracks in such projects benefits from relating such to the practise of the participating officers.

Chapter 10 further the academic discussions of change agent and reflective dialogue partner by specifically assessing the multitude of different governing techniques to bring into play to address the specifics of the encountered challenges. Both chapter 9 and chapter 10 thereby specifically brigs this litterateur tradition of organisational learning and change agents into the energy gab literature, where such facilitating discussions have been rather absent. The chapter 9 and 10 is furthermore a specific linking of the learning discussions and governance literature, as the learning perspective exactly is directed at improving the overall governability by adapting the regimes of practises.

These six chapters thus add different perspectives to the role of the local authorities in the governance of climate change specifically in relation to their interaction with local companies on the mitigating agenda.

The thesis confirms that the lack of a clear distribution of responsibilities in respect of climate change and energy indeed poses significant constraints for adopting these agenda into local government day-to-day practices – even among municipalities with the climate change agenda high on the political agenda. This clearly calls for more clarification in terms of determining and/or clarifying actual legal base and responsibilities in respect to direct regulation of companies as well as how to navigate their specific roles and establish synergies in respect of the huge diversity of actors already active as change agents in this field.

It does also shows that there in spite of the lack such clear formal responsibilities are many possible ways to engage in such governing processes anyhow and even establish synergies to other municipal agendas e.g. linking the climate change agenda to the renewed focus on local business developments, green growth and municipality procurement and public private partnership etc.

This thesis has shown how municipalities are beginning to use a combined focus on climate change and local business development strategically under the umbrella of green growth to redefine and reorganise the municipality task that already point at some commencing altering of municipal practice to act across past establish distinct arenas and administrative boundaries and to seek public private collaborations and partnering to find better and smarter solutions to societal challenges. However, this is still in its infantile and far from developed into a new regime of practise.

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APPENDICES

Appendix A. List of empirical data – interviews, notes and excel sheets

This appendix contains a list of the different empirical data and inputs collected throughout the Carbon 20 project forming the empirical base of this PhD. As mentioned in chapter 2, this is not entirely complete, as not all notes have been made electronically available. All the here listed empirical data is electronically available for the PhD assessment committee. All the material is in Danish and so is the name of the files in the electronically available materials.

Excel Sheets

Excel Sheet 1 – overall sheet containing information on each of the participating companies in relation to type, seize, owner or tenant, number of, information on the number of suggestion in the screenings, in the action plan and implemented by the end of the project, the calculated GHG emissions for 2010, 2011, 2012 and 2013 as well as added statements from interviews on encountered challenges.

Excel Sheet 2 – sheet covering specific information on the different suggested provided in each of the screenings offered the participating companies with the information dragged over to a 2nd and 3rd ark in respect to respective included in action plan and judged implemented at the termination of the project.

Preliminary questionnaire

Responses from each of the seven municipalities

1st round of monitoring end 2011 (beginning 2012)

07/11 2011 – Notes from status meeting between project manager and all participating officers in Kolding

08/11 2011 – Notes from status meeting between project manager and all participating officers in Herning

17/11 2011 – Notes from status meeting between project manager and all participating officers in Næstved

19/12 2011 – Interview (summary) Per Møller, Officer in Allerød

21/12 2011 – Interview (summary) with Kasper Ullum, Lil Dueholm, and Christine Thorsen, Officers in Ballerup

10/01 2012 – Interview (summary) with Trine Bjørn Olsen and involves colleagues, Officers in Herning

10/01 2012 – Interview (summary) Elin Korsholm Laursen and Christian Jacobsen, Officers in Kolding

18/01 2012 – Interview (summary) Eric Jørgensen, Lotte Kjærsgaard and Peter Danielsen, officers in Copenhagen – including notes from coordination meeting between Copenhagen and the project manager (the 16/01 2012)

27/03 2012 – Interview (telephone) Trine Bjørn Olsen, officer Herning, on the cooperation with the energy consultants

27/03 2012 - Interview (telephone) Per Møller, officer Allerød, on the cooperation with the energy consultants

27/03 2012 - Interview (telephone) Lil Dueholm, officer Ballerup, on the cooperation with the energy consultants

2nd round of monitoring end 2012 (beginning 2013)

11/10 2012 – Interview (Transcribed) Lil Dueholm, Christine Thorsen and Kasper Ullum (arrived late), Ballerup

25/10 2012 – Interview (transcribed) Lone Teglkam, officers in Næstved – including notes from a preliminary status meeting between project management and all involved officers in Næstved municipality

01/11 2012 – Interview (transcribed) Elin Korsholm Laursen, Officer in Kolding

01/11 2012 – Notes from status meeting between project management and Herning municipality

02/11 2012 – Interview (transcribed) Trine Bjørn Olsen, Officer in Herning

19/11 2012 – Interview (transcribed)) Erik Jørgensen, Copenhagen

19/11 2012 – Interview (transcribed)) Lotte Kjærsgaard, Copenhagen

26/11 2012 – Interview (transcribed) Peter Danielsen, Copenhagen

30/11 2012 – Interview (transcribed) Birgitte Larsen, officer Albertslund Municipality together with Ole Løgtholt Pedersen and Niels Hansen from Albertslund District heating company (internal unit of the municipality)

07/01 2013 – Interview (transcript) Per Møller, Allerød

3rd Round of Monitoring end 2013

Completed qualitative questionnaire by all municipalities

03/06 2013 – Notes from meeting on activities after Carbon 20 with Næstved Municipality

11/06 2013 – Notes from status meeting with Allerød

18/11 2013 – Notes from meeting on activities after Carbon 20 with Ballerup

06/12 2013 – Notes from meeting on activities after Carbon 20 with Allerød

Observations from various project meetings, workshops etc.

24/01 2012 – Notes from project meeting

15/08 2012 - Notes from project meeting

06/11 2012 – Notes from specific session on enhancing competences of participating officers

11/10 2012 – Notes from project meeting

Interviews and observations from six-month period with office space at Allerød Municipality (autumn 2012)

23/08, 03/09, 06/09, 24/09 – Notes taken from short conversations with the officers involved in Carbon 20

03/09 – Notes conversation Kurt Borella on Nature conservation

04/09, 07/09, and 25/09 – Notes from conversation with officers in Allerød involved in cooperation with PP Møbler on afforestation in connection to a climate adaptation project (Pernille Enevolsen, Jesper, Michael Pedersen and Allen Køtter). Includes also summaries of the important Acts related to this case

06/09 and again (follow up) 03/10 – Interview (transcript) with Michael Trøjborg Tomsen, academic secretary for the Major in Allerød

13/09 – Notes from internal coordination meeting between officers involved in respective Carbon 20 project, and a parallel Formel-M also targeting local companies on the climate agenda – with focus on transport

01/10 – Interview. Pernille Enevolsen (Notes), officer in Allerød

05/11 – Notes internal meeting of upcoming revision of climate action plan

7/11, 8/11, 9/11 – Various notes from different conversation with officers in Environment and Technical department in Allerød municipality

12/11 – Intw. (notes) Annette Pedersen, officer in charge of the climate action plan (and work related to Allerød green city commitment), and specifically also the internal coordination of own action (organisation) and action towards citizens

15/11 – Intw (notes) Niels-Erik von Freiesleben, Head of Environmental section Allerød (have unfortunately lost a later recorded (and longer) interview, where I didn't take notes)

20/11 – Notes conversation about internal coordination in Allerød

20/11 – Interview (summary) Stinne Bjerg – officer responsible for the Formel-M

17/12 - Interview (summary/transcript) with three officers from the building/construction approval unit in Allerød municipality

Interview and observations from companies

03/09 2012 – Notes from participation at Allerøds follow up meeting with Krøll Cranes and subsidiary interview (notes)

06/09 2012 – Notes from participation at Allerøds follow up meeting with Fritz Hansen and subsidiary interview with Louise Them Kjølholm (notes)

10/09 2012 – Notes from participation at Allerøds follow up meeting with PP Møbler and subsidiary interview with Søren Holst Pedersen and Kasper Holst Pedersen (notes)

20/09 2012 – Notes from an exchange of experience session among the Carbon 20 companies and the municipality in Allerød, held at Krøll Cranes

24/09 2012 – Notes from participation at Allerøds follow up meeting with Niras (participating in the Formel-M project, not Carbon 20) and subsidiary interview

(notes) with Kasper Mikkelsen, Klima og Energi, og Lene Skyberg, Mobility Management.

01/10 2012 – Notes from a progress meeting of the Formel-M project in Allerød

05/10 2012 – Notes from midterm Carbon 20 workshops with presentations by companies

10/10 2012 – Notes from participation at Allerøds follow up meeting with Holms Finmekanik and subsidiary interview (notes).

04/12 2012 – Notes from participation at Allerøds follow up meeting with Profil Markise and subsidiary interview (notes) with Michael Durup

10/12 2012 – Notes from participation at Allerøds follow up meeting with Rosa Holm and subsidiary interview (notes) with Jan Becker Hansen (COO) and Dan Ove Petersen (Quality manager)

12/10 2012 – Interview/Meeting (notes/summary) with Morten Ørsager from Erik Møller Architects (EMA)

Interview other actors of the project

17/03 2012 – Interview (Summary) Jens Ellevang, Energy Consultant from Schneider Eclectic (also participating as company in respect of internal saving – but focus in the interview on the role as energy consultant)

11/04 2012 – Interview (telephone) Palle Sand, energy consultant from Seas-NVE

17/04 2012 – Interview (telephone) Jørgen Pagh, energy consultant from Tre-For

19/04 2012 – Interview Bjørn Bruus Rasmussen, Energy consultant from Vestforbranding

25/05 2012 – Interview Hans Erling, Danish Environmental Protection Agency (mst)

15/06 2012 – Interview Carsten Blume, Vice director Albertslund Municipality and Head of steering group – "project owner"

15/11 2012 – Interview (telephone) Jens Ellevang, energy consultant at Schneider Electric

10/04 2013 – Notes from evaluation meeting held between the participating municipalities and used Energy consultants

11/12 2013, 24/01, 17/02, 08/04 and 09/04 2014 – mail correspondence with different officers in Danish Environmental Protection Agency

Other input

26/04 2012 – Notes from participation at a municipal conference "Politikker forum 2012"

07/06 2012 – Notes from participating in an workshop arranged by "Go´Energi" on municipality roles in respect encouraging energy savings by local business sector

14/06 2012 – Interview (telephone) Christian Eriksen from Project Zero (another similar project)

11-14/09 2012 – notes from participating in ECEEE industrial summer study 2012 with the participating of several Danish Energy utilities and other energy actors

22-24/10 2012 – notes from field visit to Toyota Material Handling during GIN 2012 in Linkoping

26/10 2012 – Motes from meeting with Peter Maagøe from Viegand Maagøe

03/11 2012 – Notes from participating meeting between Allerød and the business organisation and municipality of Viborg

Working notes based on varies inputs

Note on the 7 different Carbon 20 municipalities Climate Action Plans

Two versions of note on the Business support system in Denmark and specifically the Carbon 20 municipalities

Note on other similar Klimate networks activities in Denmark

Preliminary draft input for different elements to include in a municipal strategy.

Appendix B. Cleaner technology – firms, authorities and the environment

This appendix consists of a Danish chapter in a resent published book covering some of the same topic as Chapter 7 of this PhD, that I have contributed to:

Remmen, A.; Dirckinck-Holmfeld, K. and Holm, EH. (2015). Kapitel 7. Renere Teknologi – virksomheder, myndigheder og miljø. In Arler, F; Moesgaard, MA. And Riisgard, H. *Bæredygtighed – Værdier, regler og metode*. Denmark, Aarhus universitetsforlag. pp. 169-198 (Chapter 7).

The above chapter has been prepared simultaneously with the paper reprinted as chapter 7 of this thesis and both includes cross-references to each other. The focuses does very some – also in terms of my contributions – whereby it is judge that reprinting this chapter here does add some different insight to the issue addressed in chapter 7 of this thesis as well.

For reprint of the chapter see the next pages.

KAPITEL 7

Renere teknologi – virksomheder, myndigheder og miljø

Arne Remmen, Kasper Dirckinck-Holmfeld & Eskild Holm Nielsen

Introduktion

Renere teknologi er synonym med forebyggende miljøarbejde og er en højt prioriteret miljøstrategi blandt både virksomheder og miljømyndigheder. Med introduktion af renere teknologi som det bærende princip i miljøbeskyttelsesloven fra 1991 blev forebyggelse et fælles anliggende mellem virksomheder og myndigheder. Virksomhederne skal principielt basere miljøbeskyttelsen på renere teknologi, og implementering heraf sker i samspil med miljømyndighederne.

Formålet med dette kapitel er at introducere renere teknologi-begrebet og relatere til ændringer i såvel virksomhedernes miljøarbejde som i myndighedernes miljøregulering. I mange år har industrien arbejdet med renere teknologi i form af ressourcebesparelse, procesoptimeringer og intern genanvendelse (Dansk Industri 1995). Ligesom f.eks. brancheorganisationerne har taget del i at udbrede kendskabet til renere teknologi og miljøledelse blandt virksomhederne. Med andre ord har industrien nationalt og internationalt udviklet og implementeret forebyggende miljøstrategier, og myndighederne har søgt at skabe incitamenter hertil gennem lovgivning. Dette kan karakteriseres som fremme af *selvregulering* – dog med det forbehold, at ikke alle virksomheder er lige proaktive på miljøområdet. Derfor analyseres det også, hvordan renere teknologi kan fremmes via den normative miljøregulering. Virksomhedernes miljøstrategi og myndighedernes miljøregulering må betragtes som komplementære og hinandens gensidige forudsætninger. Fokus i artiklen er altså, hvordan kan der skabes en øget synergi mellem virksomhedernes selvregulering og myndighedernes miljøregulering?

Renere teknologi – virksomheder og myndigheder

Renere teknologi blev første gang introduceret i 1983 i forbindelse med Miljøstyrelsens redegørelse om genanvendelse og renere teknologi (Miljøstyrelsen 1983). Renere teknologi har i Danmark altid været bredt defineret, jf. den officielle definition: "at

forurening og affald som følge af fremstilling, anvendelse og bortskaffelse af produkter søges elimineret eller begrænset så tæt på kilden som muligt. Dette medfører, at man ændrer produktet eller fremstillingsprocessen således, at den samlede belastning af miljøet fra samfundets materiale- og stofkredsløb reduceres mest muligt" (Miljøministeriet 1992).

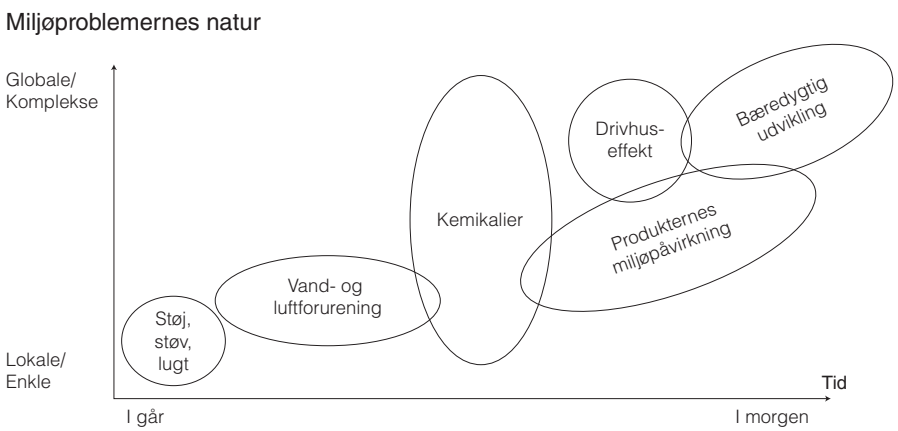
Danmark fik som et af de første lande et renere teknologi-udviklingsprogram i 1986. Herefter kom der to handlingsplaner for renere teknologi frem til 1997. De første renere teknologi-programmer havde fokus på udvikling af rent tekniske løsninger i produktionsprocessen. Evalueringerne af renere teknologi-indsatsen dokumenterede ganske positive effekter af indsatsen, men også begrænsninger i forhold til specielt spredning af resultaterne. Evaluering af renere teknologi-indsatsen blev gennemført i 1990, i 1994-1995 og i 1998-1999 (Miljøstyrelsen 1990; Andersen & Jørgensen 1995; Remmen 2000).

Fra midt i 1990'erne blev der iværksat to programmer, som havde fokus på miljøledelse samt på brancheløsninger i små og mellemstore virksomheder. Hermed kom miljøforbedringer i den løbende drift (ledelsen) i fokus, og grundlaget for videnspredning blev forbedret, mens fokus fortsat var produktionsprocesser frem for produkter. Disse erfaringer er blevet dokumenteret i et par evalueringer (Christensen et al. 1997; Oxford Research 2001). Handlingsplanen for renere teknologi og miljøledelsesprogrammerne blev fra 1999 afløst af programmet for renere produkter og sidenhen andre ordninger, jf. boks 7.1.

Som det fremgår, er titlerne på disse programmer løbende ændret, hvilket kan betragtes som en læreproces, hvor nogle problemer efterhånden kom under kontrol via udvikling af nye løsninger og virkemidler, mens andre problemer tiltrak fokus på grund

- Udviklingsprogrammet for renere teknologi 1986-1989: 90 mio. kr.
- Handlingsplanen for renere teknologi 1990-1993: 230 mio. kr.
- Handlingsplanen for renere teknologi 1993-1997/98: 375 mio. kr.
- Forebyggende miljø- og arbejdsmiljøarbejde i små og mellemstore virksomheder 1994-1997/98: 80 mio. kr.
- Miljøledelse i mindre virksomheder (EMAS) 1995-1999: 120 mio. kr.
- Renere produkt-programmet 1999-2003: 494 mio. kr.
- Virksomhedsordningen 2004-2007: 144 mio. kr. (kun noget heraf til RT)
- Støtte til fremme af miljøteknologi 2008-2011: 95 mio. kr.
- Miljøteknologisk Udviklings- og Demonstrations Program 2012: 60 mio.

Boks 7.1. Programmer for renere teknologi og miljøledelse.

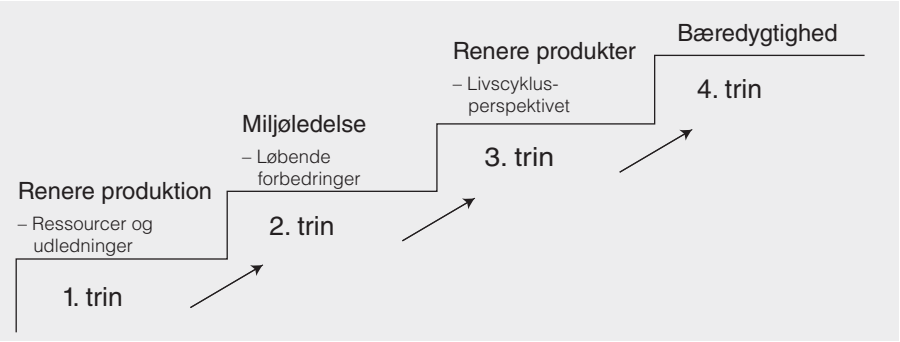


Figur 7.1. Forskellige forståelser af miljøproblemerne (Dansk Industri 2001).

af ny viden, mangelfulde løsninger eller en kombination heraf. Støtteprogrammerne har i hvert fald haft to intentioner: at stimulere virksomhederne til en forebyggende miljøindsats samt at udvikle nye teknologier som grundlag for miljøreguleringen. Skiftet til fokus på forebyggende miljøarbejde har haft et bredt gennemslag i industrien, også selv om den forebyggende miljøindsats fra regeringens side blev sat på pause gennem 00'erne. Hvorimod ideen om at udvikle det teknologiske vidensgrundlag for miljøregulering af produktionen må siges at være opgivet nationalt, eller rettere i realiteten overladt til EU.

Ændring i støtteprogrammerne afspejler, at klassiske miljøproblemer med røg, støj og møg efterhånden er reduceret eller kommet så meget under kontrol, at virksomheder og myndigheder har udvidet fokus til også at inkludere andre typer miljøproblemer. Gårsdagens miljøproblemer var ofte både synlige, lokale og fra markante enkeltkilder og dermed oplagt genstand for de lokale miljømyndigheders regulering. Med det gradvise skifte i fokus mod de globale, diffuse og komplekse miljøproblemer, så bliver der brug for regulering på andre niveauer som f.eks. EU og andre internationale organer, uden at de lokale myndigheders indsats herved bliver overflødig. Selv om figuren efterhånden er af ældre dato, så er "i morgen" ikke begyndt endnu for hovedparten af de danske virksomheder, og her har kommunerne en nødvendig faciliterende og oplysende rolle. Enkelte virksomheder har dog set potentialet i at udvikle renere produkter og øge indsatsen i forhold til bæredygtig udvikling.

Den forebyggende miljøindsats har ændret fokus og omdrejningspunkt i løbet af 1990'erne og 00'erne. Kort fortalt, så er fokus i renere teknologi-indsatsen ændret *fra* næsten udelukkende tekniske udviklings- og demonstrationsprojekter *over* bredere



Figur 7.2. Løsningsorienterede tilgange i en forebyggende miljøindsats.

aktiviteter til at fremme spredning af renere teknologi og miljøledelse *til* en højere grad af integration af den forebyggende miljøindsats i relation til virksomhederne, netværket og myndighederne (for en uddybet gennemgang af handlingsplanerne henvises til Remmen 1995 & 1998).

Skiftet i fokus for miljøindsatsen er altså ændret *fra* produktionsprocesser (fabrikken) *over* miljøledelse (organisationen) *til* renere produkter (produktkæden). Derudover arbejder nogle virksomheder med, hvad bæredygtighed og social ansvarlighed (CSR) konkret betyder for den enkelte virksomhed. Disse ændringer er gennemgribende i den konceptuelle forståelse af den forebyggende miljøindsats, jf. figur 7.2, men det praktiske gennemslag i virksomhedernes arbejde er mere differentieret og varierer betydeligt fra branche til branche.

Sammenlignet med sidst i 1980'erne er renere teknologi-indsatsen grundlæggende forandret og er i dag identisk med princippet om forebyggelse af miljøpåvirkningerne i produktets livscyklus. Samtidig har der været en stilstand gennem 00'erne, f.eks. med tilbagevenden til støtte af rensningsforanstaltninger via Virksomhedsordningen. Dette understreger, at figur 7.2 ikke skal ses som en fremadskridende historisk udvikling, men nærmere som analytiske begreber til at forstå forskelle i fokus i den forebyggende miljøindsats.

Ændringerne i konceptet og de gennemførte projekter skyldes en ændring i forståelsen af miljøproblemerne og deres løsning, såvel som øget erkendelse af den kompleksitet, der kendetegner virksomhedernes forebyggende miljøarbejde og myndighedernes miljøregulering. Renere teknologi og forebyggende miljøarbejde er blevet synonyme og forbindes med aktiviteter, værktøjer og virkemidler anvendt af virksomheder og myndigheder, såsom:

- Renere produktionsprocesser og produkter
- Medarbejderdeltagelse og forpligtelse af ledelsen
- Miljøledelse, grønne regnskaber og livscyklusvurdering
- Leverandørstyring og miljøsamarbejde i produktkæden
- Økonomiske virkemidler i form af afgifter og tilskud
- Miljømærkning og grønne offentlige indkøb
- Forbrugerinformation, miljøanvisninger og -anprisninger
- Tilbagetagningsordninger, standardisering og udvidet producentansvar
- Brancheorienteringer om mindst forurenende teknologi
- Miljømyndighederne som serviceorienteret modpart.

Forebyggelse – fra fabrik over organisation til produkter

Virksomhederne har gradvist udvidet renere teknologi-indsatsen fra optimering af produktionsprocesser over miljøledelse til renere produkter. Inden indholdet i disse aktiviteter beskrives, kan det være nyttigt at opridse baggrunden for skiftet fra rensning til renere teknologi.

Rensningsforanstaltninger – de såkaldte end-of-pipe-løsninger – har udelukkende fokus på udledningerne fra virksomhederne og sætter altså ind, *efter* problemet er opstået. Dette medfører ofte, at et miljøproblem bliver transformeret til et andet, f.eks. fra spildevand til slam, fra røg til affald i form af flyveaske etc. Disse løsninger har virksomhederne overvejende set som omkostninger både i forbindelse med anlægsinvesteringer og med driftsudgifter. Set fra virksomhedernes og samfundets synsvinkel er det væsentligt som første prioritet at reducere forurening og ressourceforbrug ved kilden inde i virksomhederne, da dette reducerer både miljøproblemerne og de økonomiske omkostninger forbundet med rensning. Forebyggelse fordrer altså, at renere teknologi har første prioritet, og at virksomhederne tager ansvar for at etablere et forebyggende miljøarbejde – med andre ord en form for selvregulering.

Renere teknologi-indsatsen har frem til midt i 1990'erne overvejende fokuseret på at reducere ressourceforbrug og udledninger fra *produktionsprocessen*. Det nye ved renere teknologi i forhold til end-of-pipe og rensning er interessen for input i form af ressourceforbrug, og hvordan der kan spares herpå. Via tekniske udviklings- og demonstrationsprojekter bliver der lagt vægt på at vise, at miljøproblemerne kan reduceres ved kilden inde i fabrikken.

Fordelen var, at det var relativt enkelt at plukke de lavt hængende frugter, og at der via teknisk optimering og ændring af arbejdsrutiner blev opnået både miljøforbedringer og økonomiske besparelser. "Forebyggelse betaler sig," har mange danske virksomheder erfaret i praksis. Eksempelvis har de danske slagterier reduceret vandforbruget fra ca.

1.000 liter vand per slagtet gris i 1980'erne inden Vandmiljøhandlingsplanerne til omkring 250 liter midt i 1990'erne og yderligere til 200 liter per gris på Tican-slagteriet i 2004 (Tican slagteriet 2004/2005). Miljø kan være en anledning til besparelser, effektivisering og omkostningsreduktioner. I dag bliver lignende tiltag kaldt for "green and lean"-projekter.

Svagheden var, at der ofte var tale enkeltstående projekter, som ikke blev til en vedvarende aktivitet forankret i virksomheden, ligesom erfaringerne heller ikke blev spredt til andre virksomheder. Fokus var primært på teknisk optimering af produktionsapparatet frem for forbedret miljøhusholdning i form af ændringer i arbejdstilrettelæggelse samt af rutiner, holdninger og adfærd (Remmen 2000).

Siden midt i 1990'erne og frem til først i 00'erne blev omdrejningspunktet for industriens forebyggende indsats *miljøledelse* i form af "husmandsmodeller" eller certificerede miljøledelsessystemer i henhold til ISO 14001. I 2005 var omkring 900 danske virksomheder ISO 14001-certificeret, mens 120 var registreret i henhold til EMAS-forordningen, hvoraf de 95 virksomheder samtidig havde ISO 14001 (Ringbæk 2005). Da miljøledelse var på sit højeste, havde ca. 1000 virksomheder et formaliseret miljøledelsessystem, og mindst et tilsvarende antal havde indført mindre formaliserede former for miljøledelse bl.a. via deltagelse i Green Network og tilsvarende netværk rundt om i landet. I de senere år er der faktisk sket et fald i certificerede virksomheder til 811 med ISO 14001 og 69 med EMAS (personlig kommunikation, Miljøstyrelsen 2012). Miljøledelse er langtfra et udbredt fænomen i Danmark, idet der findes 6.500 godkendelsespligtige virksomheder med potentiale for miljøforbedringer, og hvor miljøledelse er relevant (Miljøministeriet 2011).

Med miljøledelse er fokus udvidet fra teknik til organisation, fra tekniske procesoptimeringer til de organisatoriske forudsætninger i virksomhederne for en systematisk og kontinuerlig miljøindsats. Fordelen ved miljøledelse er, at indsatsen bliver forankret bredere blandt ledelse og medarbejdere, samt at virksomheden forpligter sig til at være bedre end lovgivningens krav og til at lave løbende miljøforbedringer. På disse punkter er EMAS mere eksplicit end ISO 14001, herunder stiller EMAS mere klart krav om, at forbedringerne skal være af den materielle performance.

For virksomhederne handler det om at etablere en *systematik*, der forankrer miljøindsatsen i organisationen gennem opstilling af procedurer og instruktioner i miljøledelses*systemet*. Kombineret hermed skal der etableres en *dynamik* via miljøpolitik, -mål, -handlingsplaner og -redegørelser, som gør miljøindsatsen til en kontinuerlig aktivitet og sikrer de løbende miljøforbedringer.

Brancheorganisationer har – kraftigt tilskyndet – haft en aktiv rolle i udbredelsen af miljøledelse f.eks. ved at udarbejde branchespecifikke manualer samt via kurser og ERFA-grupper. Herved er de generelle standarder blevet "oversat" til branchens sprog,

og fokus har været på de relevante miljøproblemer, forordninger og mulige løsninger. Dette har gjort det mere overkommeligt og billigere for virksomhederne at indføre miljøledelse (se kapitel 14).

Svagheden har i nogle tilfælde været, at miljøledelsessystemet blev til et mål i sig selv frem for et middel til miljøforbedringer. Med andre ord har nogle virksomheder – understøttet af konsulentfirmaer – lagt for stor vægt på systemopbygning i form af etablering af procedurer og papirgange frem for at skabe engagement blandt medarbejdere via deres forslag til miljøforbedringer og -løsninger. Ligesom der generelt har været for lidt fokus på værdiskabelse for virksomhederne ved certificering. En anden svaghed har været, at miljøindsatsen bliver til en rutine, hvor virksomheden fortsætter med samme indsatsområder og efterhånden mister gejst eller bliver opslugt af nye udviklingsprojekter. Når mulighederne for at reducere ressourceforbruget bliver marginale, bliver det relativt omkostningstungt at gennemføre yderligere ressourcebesparelser samt at drive ledelsessystemet og finde midlerne til de eksterne audits.

Før eller siden vil løbende miljøforbedringer inden for virksomhedens hegn betyde, at der ikke er "så meget mere at komme efter", altså at ressourceforbrug og forurening er reduceret til et omfang, hvor de økonomiske og miljømæssige fordele er marginale. Hvordan kan virksomhederne så lave løbende forbedringer? Et oplagt skridt er at brede miljøindsatsen ud til at omfatte hele produktkæden. Livscyklusbaseret og produktorienteret miljøledelse (Remmen & Münster 2002; Schmidt et al. 2000) tager fat på de mere omfattende miljøproblemer fremhævet i figur 7.1 (se også kapitel 14) og fordrer at virksomheden aktivt går i dialog med andre aktører i produktkæden – både leverandører og kunder.

Midt i 1990'erne skiftede omdrejningspunktet gradvist over mod *renere produkter*, bl.a. udtrykt i Miljøstyrelsens debatoplæg om "En styrket produktorienteret miljøindsats". Forståelsen er, at den hidtidige renere teknologi-indsats har været vellykket i forhold til at reducere miljøbelastningen fra produktionen – inden for fabrikkens hegn. Men de største miljømæssige problemer er imidlertid knyttet til det generelle ressourceforbrug i samfundet samt til brug og bortskaffelse af visse typer af produkter. Desuden antages det, at dansk industri kan få konkurrencefordele på markedet ved at være blandt de første, som forsyner renere "produkter med en bedre miljømæssig formåen til et hurtigt voksende globalt marked" (Miljøstyrelsen 1996).

Den grundlæggende idé bag en produktorienteret miljøindsats blev illustreret som en trekant, der forbinder produkt, marked og aktører (Miljøstyrelsen 1996). Med henblik på at skabe vilkårene herfor er det nødvendigt at forbinde tre forskellige perspektiver (ibid.: 13):

- at udvikle produkter med mindre miljøpåvirkninger og indhold af miljø- og sundhedsskadelige stoffer, mindre energiforbrug og mindre brug af ikke-fornyelige ressourcer
- at udvikle og markedsføre produkter, som er konkurrencedygtige på pris, funktion, kvalitet og miljø
- at alle aktørgrupper kan og vil deltage i at reducere miljøpåvirkningerne fra produkterne.

Styrken ved fokus på renere produkter er, at miljøforståelsen er bredt ud til hele produktets livscyklus, og at virksomhederne har mulighed for at opnå strategiske konkurrencefordele på markedet ved at differentiere produktet miljømæssigt fra konkurrenterne. Erfaringer fra virksomheder som Grundfos og Danfoss understøtter dette, da de har opnået konkurrencefordele ved at udvikle og markedsføre produkter med en markant energi- og miljøprofil. Ligesom den danske vindmølleindustri har været udtryk for samme tendens til, at en fremadrettet energi- og miljøpolitik kan give virksomhederne en komparativ fordel.

En iøjnefaldende svaghed ved den produktorienterede miljøindsats er, at relativt få virksomheder har satset på at udvikle og markedsføre renere produkter. Eksempelvis skønnes antallet af danske virksomheder, som gør brug af livscyklusvurderinger at være mellem 50 og 100. Mens antallet, som internt i virksomheden behersker metoden detaljeret, blot er en håndfuld. Ydermere er brugen af de officielle miljømærker yderst beskeden i de fleste brancher; dog har Svanen og Blomsten vundet stor udbredelse i henholdsvis den grafiske branche og i tekstilindustrien via en aktiv indsats af centrale aktører i de to brancher. Tilsvarende er miljømærkerne også uhyre udbredt på vaskepulver og i det hele taget på sæbe og personlig pleje-produkter, der kommet i tæt kontakt med huden.

En del af forklaringen på den begrænsede udbredelse er, at værktøjerne og kompetencerne ikke helt har været tunet ind på dette skift i miljøpolitikken. Værktøjer baseret på livscyklusvurdering er forsøgt anvendt på et alt for detaljeret niveau, hvorved miljøindsatsen er gået "datadød" med diskussioner om datakvalitet og datamangel frem for konkrete miljøforbedringer af produktet (se kapitel 16 og 17 om livscyklusvurdering og om eco-design). Man har forsøgt at råde bod herpå gennem udvikling af mere simple metoder til miljøvurdering, gennem enkle retningslinjer for produktforbedringer som ved eco-design samt ved fokus på det konkrete samarbejde om miljøforbedringer i produktkæden (for oversigt over værktøjer m.v., se Remmen & Münster 2002).

Renere teknologi har de sidste 25 år ændret sig dynamisk som udtryk for en udvidet forståelse af såvel miljøproblemerne som løsningerne. Industriens miljøproblemer er ikke kun relateret til ressourceforbrug og udledninger fra produktionen, men til

Koncept	Innovationsfokus	Incitamenter for virksomhederne
Renere produktion	Teknisk optimering God miljøhusholdning	Omkostningsreduktion Ressourcebesparelser
Miljøledelse	Organisatorisk Branchesamarbejde	Image/dokumentation Spredning/formidling
Renere produkter	Produktinnovation Produktkæden	Konkurrencefordele Troværdighed

Tabel 7.1. Fokus og incitamenter i renere teknologi-indsatsen.

miljøpåvirkningerne i hele produktets livscyklus. Tilsvarende er løsningerne ikke blot teknisk optimering af produktionen, men en løbende indsats med at reducere miljøpåvirkningerne i hele produktets livscyklus. Med andre ord, fokus for løsningerne er blevet udvidet, ligesom virksomhedernes incitamenter til et forebyggende miljøarbejde er udvidet fra ressourcebesparelser til potentielle markedsfordele. Miljø og økonomi handler ikke længere blot om procesoptimering og omkostningsreduktion, men om at virksomhederne opnår konkurrencemæssige fordele ved at udvikle og markedsføre renere produkter.

Renere produkter er *ikke* det ultimative koncept. Der er givet flere trin på vejen mod en mere bæredygtig udvikling i industrien. For virksomhederne handler det om at se miljø som en udfordring, der kan anvendes til kritisk at vurdere det eksisterende produkt. Måske kan og bør produktet ud fra en miljøbetragtning ændres til en renere service – telefonsvareren som en selvstændig kasse er afløst af en service hos teleselskaberne eller er integreret i mobiltelefonen.

Dette er en form for dematerialisering, hvor fokus er på, via teknologisk udvikling, at øge ressourceeffektiviteten. Denne tilgang er kendt som faktor 4 og 10 (Schmidheiny 1992 og von Weizsäcker et al. 1998). Ressourceeffektiviteten kan også øges ved at lave om på spillereglerne mellem leverandør og kunde, ved at ændre på forståelsen af produktet, via en ny forretningsmodel. Eksempelvis har nogle bilproducenter indgået nye typer aftaler med deres farvelak-leverandører, hvor produktet ændres fra farvelak til den malede og lakerede overflade. Ved en sådan ændring af spillereglerne opstår der mulighed for partnerskab mellem leverandør og kunde med mulighed for at have en fælles interesse i at nedbringe den nødvendige mængde, reducere spildet, udvikle mere holdbare overflader osv. Forhandlingerne om tekniske egenskaber, kvalitet, miljøforhold m.v. kommer til at foregå på et andet grundlag med en sådan redefinering af relationen mellem leverandør og producent. En række eksempler herpå er fremhævet af tænketanken "Bæredygtigt forbrug og grønne for-

retningsmodeller" (Miljøstyrelsen 2013b) og i rapporten *Leasing Society* (European Parliament 2012).

Myndighedsregulering og renere teknologi

Introduktionen af renere teknologi-tankegangen har haft afsmittende virkning på den traditionelle miljøregulering. I 1990'erne skete der en fornyelse af miljøreguleringen for at stimulere mere direkte til forebyggelse frem for blot rensningsforanstaltninger. Målet var, at den offentlige miljøregulering skulle sætte en minimumsgrænse for de tilladelige udledninger til miljøet, mens selvreguleringen i de proaktive virksomheder skulle sikre løbende miljøforbedringer og samtidig fungere som gode eksempler, der viser vejen for de reaktive virksomheder.

I den normative regulering er miljøgodkendelserne – i intentionen – blevet mere fokuseret på forebyggelse, og som opfølgning kan myndighedernes tilsyns- og håndhævelsesaktiviteter stimulere til indførelse af renere teknologi. I det følgende beskrives det, hvordan miljøgodkendelser samt tilsyn og håndhævelse er forsøgt ændret, ligesom grønne regnskaber berøres kort afslutningsvis.

Renere teknologi var oprindeligt tiltænkt en central rolle i miljøpolitikken. Hensigten i Miljøstyrelsen var, at de gennemførte renere teknologi-projekter skulle udgøre det videnskabelige grundlag for at revidere den normative regulering (Miljøstyrelsen 1989). Idéen var at ændre og revidere regelgrundlaget i miljøbeskyttelsesloven på en måde, så reglerne successivt afspejlede udviklingen af renere teknologier. Grænseværdier og generelle regler i bekendtgørelser, vejledninger og cirkulærer skulle baseres på resultater fra renere teknologi-projekterne.

Idéen om at lade de gennemførte renere teknologi-projekter være det videnskabelige grundlag for en modernisering af den normative regulering led skibbrud, da det ville underminere virksomhedernes interesse i at indgå i projekterne. Ligesom det var tvivlsomt, om myndighederne havde de fornødne økonomiske og vidensmæssige ressourcer til løbende at revidere hele regelgrundlaget i overensstemmelse med udviklingen i renere teknologi (Andersen og Jørgensen 1995). I stedet blev der lagt op til, at renere teknologi skulle udbredes ved at blive inddraget som centralt aspekt ved miljøgodkendelser af virksomheder.

Renere teknologi blev i 1991 det bærende princip med ændringen i miljøbeskyttelsesloven. I lovens § 3 hedder det, at administrationen heraf skal baseres på, hvad der er opnåeligt ved anvendelse af mindst forurenende teknologi (Miljøbeskyttelsesloven 1991). I 1999 blev begrebet ændret til bedst tilgængelige teknik (Miljøbeskyttelsesloven 1999) som følge af IPPC-direktivet – Integrated Pollution Prevention and Control. 'Bedst' afspejler "den mest effektive teknik til opnåelse af et højt generelt beskyttel-

sesniveau for miljøet som helhed". Med tilgængelig forstås, "udviklet i en målestok der medfører, at den pågældende teknik kan anvendes i den relevante industrisektor på økonomisk og teknisk mulige vilkår, idet der tages hensyn til omkostninger og fordele …". Med teknik menes "den anvendte teknologi og den måde, hvorpå anlæg konstrueres, bygges, vedligeholdes, drives og lukkes ned (EU 1996). Begreberne er synonyme med den internationale betegnelse BAT (Best Available Technology).

Både internationalt og i Danmark har der været diskussion om, om tilgængelighed skal forstås i forhold til at være baseret på generelle branchevurderinger, eller om det skal vurderes specifikt i forhold til den enkelte virksomheds situation og kontekstuelle betingelser. I praksis forsøger man en mellemting med identifikation af, hvad der kan opnås generel enighed om i branchen samt med visse muligheder for tilpasninger.

Miljøgodkendelser

Miljøgodkendelser er en af reguleringsformerne, der regulerer de godkendelsespligtige virksomheders miljøforhold, herunder brug af renere teknologi. I Danmark har miljøgodkendelser været tænkt som en hovedhjørnesten i miljøreguleringen lige siden miljøbeskyttelseslovens ikrafttræden i 1973. I princippet reguleres *alle* virksomhedens miljøforhold gennem miljøgodkendelsen, men praksis har været en anden, idet der kræves en separat spildevandstilladelse, og affald blev først i 1999 eksplicit en del af godkendelsessystemet, mens energi og drivhusgasser stadig ikke nævnes eksplicit som selvstændige fokusområder.

Med vedtagelsen i EU af IPPC-direktivet er der indført europæiske regler for miljøgodkendelser. I lighed med det danske regelsæt bygger direktivet på integration af alle miljøforhold og på BAT. Ved implementering af IPPC-direktivet i 1999 blev de danske regler udfordret i relation til, at:

- færre virksomheder er omfattet af IPPC end af det danske godkendelsessystem
- energieffektivitet er inkluderet i IPPC – modsat den danske praksis
- IPPC opererer med en offentlighedsfase i forbindelse med ansøgning
- miljøgodkendelser skal tages op til revision efter en passende tid.

Fra januar 2005 indførte den danske regering en forenkling af miljøgodkendelser for omkring 4.400 af de i alt 6.250 virksomheder (industrivirksomheder – landbrug ikke medtaget, da det sorterer under en anden bekendtgørelse) omfattet af godkendelsespligten (Miljøstyrelsen 2004; Miljøministeriet 2011). Der skelnes mellem virksomheder optaget på henholdsvis bilag 1 og 2 i godkendelsesbekendtgørelsen. Bilag 1-virksomhederne er genstand for fuld individuel godkendelse, mens bilag 2-virksomhederne

er under et simplificeret system. Som led i implementering af EU's revision af IPPC direktivet (IED) er der i 2013 gennemført en tilpasning, så kun de ca. 800 IED/IPPC-virksomheder er omfattet af bilag 1, mens resten er under bilag 2. Omkring 250 virksomheder har Miljøstyrelsen som myndighed frem for kommunerne (Bekendtgørelse nr. 1454 af 20/12/2012, Miljøministeriet 2013).

Bilag 1-virksomhederne er som hidtil underlagt en fuld miljøgodkendelse. Inden myndigheden kan meddele godkendelsen, skal bilag 1-virksomheder have godtgjort, at virksomheden har truffet de nødvendige foranstaltninger til at forebygge og begrænse forureningen ved anvendelse af bedst tilgængelige teknologi. Virksomhederne skal i deres ansøgning ifølge bekendtgørelsens § 13, styk 1, oplyse om mulighederne for:

- at effektivisere råvareforbruget
- at substituere særligt skadelige eller betænkelige stoffer med mindre skadelige stoffer
- at optimere produktionsprocesserne
- at undgå affaldsfrembringelse, og hvis dette ikke kan lade sig gøre, om mulighederne for genanvendelse og recirkulation
- at anvende den bedste rensningsteknologi.

Ansøgningen skal indeholde et resumé af de væsentligste undersøgte alternativer, herunder om virksomheden har valgt den mest energieffektive teknologi (Miljøministeriet 2004). Det står eksplicit, at godkendelsen ikke kan gives, såfremt disse forhold ikke er godtgjort, samt at vilkår i godkendelsen skal understøtte, at produktionen sker i overensstemmelse hermed.

Så vidt, så godt. Men i godkendelsesbekendtgørelsens § 16 bliver det opridset, hvilke vilkår miljømyndighederne kan stille, og her nævnes alene emissioner, lugt, støj etc. samt processuelle krav. Muligheden for at stille vilkår til input, energianvendelse, ressourceeffektivitet, affaldsfrembringelse m.v. nævnes *ikke* eksplicit, hvorved det forebyggende miljøarbejde tendentielt nedtones. Godt nok er der en krydsreference til, at "Vilkårene skal sikre, at kravene i § 13, stk. 1, opfyldes" – altså bedst tilgængelig teknologi. Men i praksis tolker mange tilsynsmedarbejdere i kommunerne § 16 sådan, at der ikke er hjemmel til at stille krav til forebyggelse. Eller rettere, usikkerheden betyder, at hovedparten af sagsbehandlerne i praksis afholder sig herfra (Dirckinck-Holmfeld og Smink 2013).

Som led i at forenkle og reducere ressourceforbruget til miljøgodkendelsesbehandlingen er der for *bilag 2-virksomheder* indført nogle forenklinger sammenlignet med bilag 1-virksomheder. De centrale ændringer er oplysningskravene omkring BAT samt brug af standardvilkår for udvalgte miljøpåvirkninger.

For bilag 2-virksomhederne er kravene til, hvad der skal oplyses om, lempet. I ansøgningen skal virksomheden komme med mindre detaljerede oplysninger om produktion og forureningsbegrænsende foranstaltninger. Endvidere skal virksomhederne kun oplyse om den bedste tilgængelige teknologi, hvis der foreligger oplysninger herom i Miljøstyrelsens referencer til renere teknologi-vurderinger ved miljøgodkendelser. På samme måde skal den lokale myndighed heller ikke foretage vurdering af, om virksomheden anvender BAT.

Idéen med forenklingen er, at bilag 2-virksomhederne reguleres ved hjælp af standardvilkår for de væsentligste miljøparametre, som løbende revideres i forhold til BAT. Er der for en virksomhed formuleret standardkrav, skal disse bruges i godkendelsen. Miljøstyrelsen har i samarbejde med brancheorganisationer og de decentrale myndigheder udarbejdet standardvilkår for 22 brancher som bilag til godkendelsesbekendtgørelsen, og ca. 4000 virksomheder er omfattet af disse standardvilkår (www.mst.dk).

Dette betyder imidlertid, at kommunerne på flere leder fratages muligheden for dialog med bilag 2-virksomhederne om at adressere anvendelse af renere teknologi og BAT, når virksomhederne ikke skal oplyse herom i ansøgningen. Der er tale om en administrativ lettelse for virksomheder og myndigheder, men dialogen og samarbejdet om den forebyggende indsats kunne med fordel være søgt fremmet samtidigt (se også Christensen et al. 2006).

Holland har eksempelvis indført centralt fastsatte standardkrav for at frigøre ressourcer hos de lokale myndigheder til en proaktiv dialog med virksomhederne om forebyggende og fremadrettede initiativer (Gombault & Versteege 1999).

For at understøtte såvel myndighederne som virksomhederne er der iværksat initiativer, der beskriver forskellige branchers potentiale for forebyggelse ved anvendelse af bedst tilgængelig teknologi. Denne indsats foregår overvejende internationalt, og centrale aktører er de nationale miljøstyrelser, EU, Verdensbanken, OECD, UNEP m.fl. Nedenfor beskrives det, hvordan EU og Danmark har håndteret BAT i forhold til brancherne.

Bedst tilgængelig teknologi (BAT)

Internationalt har bl.a. Verdensbanken fastlagt bedst tilgængelig teknologi for forskellige brancher. Fastlæggelse af BAT er sket alene af Verdensbankens medarbejdere, men med uformelle konsultationer med brancheorganisationer, konsulenter m.v. Verdensbanken har udgivet bogen *Pollution Prevention and Abatement Handbook* (Verdensbanken 1998), der fastlægger det opnåelige forureningsniveau ved anvendelse af BAT. Verdensbanken bruger håndbogen som udgangspunkt for miljøkrav til pro-

jekter, hvis Verdensbanken skal være långiver for eksempelvis en cementproduktion i et udviklingsland (Verdensbanken 1998).

I Europa har flere nationalstater bl.a. Danmark og Tyskland udgivet vejledninger eller retningslinjer, der beskriver BAT og de forebyggende potentialer. På baggrund af specielt erfaringerne fra renere teknologi-programmerne udarbejdede Miljøstyrelsen i 1990'erne syv brancheorienteringer (ud af 25 planlagte), der bl.a. vejledte om forskellige forebyggelsestiltag i disse brancher. Disse brancheorienteringer var et ambitiøst dansk forsøg på at koble reguleringen med renere teknologi; men de er imidlertid ikke blevet opdateret siden, ligesom der blot er produceret en enkelt ny for tekstilfarvning og -tryk i 2010 (se www.mst.dk).

Denne type regulering foregår nu i internationalt regi. I forbindelse med IPPC-direktivet blev der etableret en informationsudveksling om BAT mellem EU-medlemslandene som udgangspunkt for fastlæggelsen af BAT. Informationsudvekslingen varetages af European IPPC Bureau i Sevilla (eippcb.jrc.es). I EU kaldes dokumenterne for BREF (BAT reference document) og er udarbejdet efter samme skabelon, nemlig gennem forhandlinger mellem relevante parter, som regel industriorganisationer, myndigheder og interesseorganisationer samt i et vist omfang de grønne organisationer. Formålet med at integrere interesseorganisationer er dels at trække på deres ekspertise, dels at etablere en konsensus omkring BAT blandt organisationerne.

Der er udarbejdet 33 BREF-noter (december 2012), og langt hovedparten (28) er fra perioden 2001-2007. De sidste fem år er der blot udarbejdet fem nye BREF-noter. En del af forklaringen er, at der siden 2007 er igangsat opdatering og revisionsarbejde af de ældre BREF-noter. Desuden har EU afsat ret få økonomiske ressourcer til denne opgave, og der er ingen midler til at lave særskilte undersøgelser eller udredninger. Derfor er informationsudvekslingen afhængig af, at brancheorganisationerne og medlemslandene kommer med de nødvendige input. På baggrund heraf sammenskrives et dokument, der diskuteres mellem medlemslandenes repræsentanter og brancheorganisationerne. En forudsætning er således, at brancheorganisationernes og medlemslandenes repræsentanter bidrager med erfaringer og viden om muligheder og begrænsninger ved BAT i den pågældende branche. Når dokumentet (BREF'en) er udarbejdet, overdrages det til EU-kommissionen, der tager stilling inden offentliggørelsen.

Dokumenterne indeholder en "state of the art" om renere teknologi-mulighederne, som virksomheder og myndigheder må forholde sig til i forbindelse med miljøgodkendelser. Normalt beskrives de tilgængelige teknologier, niveauer for de opnåelige grænseværdier via renere teknologi og en vurdering af den økonomiske tilgængelighed for branchen. Herudover indeholder beskrivelserne et afsnit om miljøledelse, ligesom indretning af virksomheden er relevant, hvis dette har miljømæssig betydning. Der

findes få horisontale BREF-noter på tværs af brancher, men et oplagt eksempel er en note om energieffektivitet.

Miljøregulering via BAT kan ikke foreskrive virksomhederne at anvende en specifik teknologi, grundet hensyn til virksomhedernes ejendomsret og frygt for pådragelse af erstatningsansvar, så derfor bliver BAT i reguleringen omsat til emissions- og/eller produktionsnormer. Ved emissionsnormer omsættes renere teknologi til emissionsgrænseværdier og/eller -mængder. Produktionsnormer regulerer virksomhedens indretning, drift og vedligeholdelse. Formålet med BREF-dokumenterne er at give myndighederne et redskab til at meddele virksomhederne operationelle krav og vilkår. BAT forudsætter branchernes konstruktive deltagelse, idet de bidrager med en del af vidensgrundlaget og legitimerer valg af BAT over for medlemmerne.

Der er ikke lavet systematiske analyser af kvaliteten af de forskellige dokumenter, der forsøger at omsætte BAT til retningslinjer, som de godkendende myndigheder kan anvende i praksis. I en analyse af de første otte BREF'er med fokus på bl.a. miljøkravene blev det konkluderet, at kvaliteten er varierende, ligesom projektlederne har haft forskellige strategier for, hvor meget de satsede på at opnå konsensus i forhandlingerne (Madsen 2001). Nogle BREF'er omhandler kun de forhold, der er enighed om; mens der i andre præsenteres uenighed om centrale spørgsmål. For eksempel er der mere lempelige grænseværdier i nogle BREF'er end de af Verdensbanken fastlagte for de samme brancher. Fokus på emissionsnormer i BREF medfører tendentielt, at input i produktionsprocesserne i form af energi og ressourcer bliver nedtonet og ikke bliver omsat til konkrete anvisninger for virksomheder og myndigheder – skønt potentialet i det forebyggende arbejde netop består i at medtage energi og ressourceforbrug. Flere udviklingsprojekter både nationalt og internationalt har omhandlet denne problemstilling (jf. blandt andet IMPEL, http://impel.eu).

Med vedtagelsen af Industrial Emission Directive (IED), som afløser for IPPC, er det i EU besluttet, at BREF-dokumenterne skal være bindende i forbindelse med fastsættelse af godkendelsesvilkår og ikke blot fungere som vejledende retningslinjer. Når en ny BREF er vedtaget, skal godkendelserne i branchen revideres i forhold til det nye BAT-niveau senest fem år efter, og kun i begrænsede, specificerede tilfælde kan der afviges fra det foreslåede BAT-niveau. Eftersom BAT bliver bindende, får hele fastlæggelsen af BAT i EU karakter af egentligt lovgivningsarbejde, og proceduren herfor må derfor forventes ændret.

Hvor der tidligere var fokus på BAT som generel vejledning og retningslinje, som grundlag for dialog om fastsættelsen af vilkår lokalt, så er der nu lagt op til centralt definerede BAT-niveauer – både i EU i form af BREF og nationalt i form af standardvilkår for bilag 2-virksomhederne.

Tilsyn og håndhævelse

Myndighedernes tilsyn og håndhævelsesaktivitet skal sikre, at diverse godkendelser, tilladelser og enkeltafgørelser bliver efterlevet. Tilsyns- og håndhævelsesaktiviteterne er afgørende for at håndhæve miljøreguleringen blandt de virksomheder, der overtræder loven (Miljø- og Energiministeriet 1996). Siden miljøbeskyttelseslovens vedtagelse har der været en tilbagevendende debat om begrænsningerne i tilsynet og den mangelfulde håndhævelse af miljøloven (Andersen 1989; Christensen 1987; Georg 1993). Tilsyn og håndhævelse er et afgørende virkemiddel til at implementere den normative regulering i praksis. Miljøstyrelsen har i en årrække holdt øje med miljøtilsynene via et krav om årlige indberetninger af tilsynsaktiviteterne, som så efterfølgende offentliggøres (Miljøstyrelsen 2000).

Ud over de godkendelsespligtige virksomheder fører kommunerne også regelmæssigt tilsyn med ca. 9000 virksomheder omfattet af branchebekendtgørelser, fortrinsvis automekanikere og pelsfarme, samt ca. 35.000 virksomheder inklusive husdyrbrug, som er under gebyrbekendtgørelsen og som reguleres gennem påbud (Miljøministeriet 2011).

Miljøstyrelsens vejledning fra 1995 om virksomhedstilsyn understreger, at miljømyndighederne skal tilrettelægge tilsynet på en sådan måde, at virksomhederne stimuleres til forebyggende aktiviteter. Udgangspunktet for tilsynsarbejdet er, at virksomhederne opdeles i tre grupper, som afspejler virksomhedens miljøbelastning, dens indstilling til miljøarbejdet samt mulighederne for forebyggelse.

De decentrale miljømyndigheder skal indføre et *differentieret og situationsbetinget tilsyn*, hvor brug af virkemidler afspejler og er tilpasset den konkrete situation i form af virksomhedens miljøstrategi og -præstationer. Idéen er illustreret i tabel 7.2. Da virksomhedernes præstationer og adfærd på miljøområdet kan være ude af trit med flot formulerede miljøstrategier og -politikker, må tilsynet nødvendigvis også fokusere på de konkrete miljøpræstationer.

Hensigten med et differentieret tilsyn er at stimulere virksomhederne til at forbedre deres miljøindsats og -præstation. Samtidig skal tilsynsmedarbejderen sikre, at virksomheden overholder regler og godkendelser. Det situationstilpassede betyder, at tilsynet tilpasses den konkrete situation, hvorved *tilsynets karakter, brugen af virkemidler og myndighedsrollen* bestemmes af virksomhedens miljøstrategi og -adfærd.

Miljøstyrelsen har overvejet etablering af et særligt tilsyn for miljøpositive virksomheder – "elitevirksomheder." Dette blev opgivet, men derimod blev det anbefalet kommunerne at tilrettelægge tilsynene differentieret i forhold til allerede gældende vejledning. Frem for generelle, centrale kriterier skal tilsynet fastlægges af de enkelte kommuner. Det differentierede tilsyn kan med fordel understøttes af uddannelsesaktiviteter for tilsynsmedarbejdere (Christensen et al. 2000).

	Miljøpositiv virksomhed	Almindelig virksomhed	Miljønegativ virksomhed
Tilsynets karakter	Stikprøvetilsyn	Sædvanligt tilsyn	Intensivt tilsyn
Virkemidler	Samarbejde om miljøhandlingsplan og miljøledelse	Aftale og forhandlinger, enkel form for miljøledelse	Påbud, forbud, bøder og eventuelt politianmeldelse
Virksomhed (vil/kan)	Plus/plus	Plus/minus	Minus/minus
Myndighedsrolle	Sparringspartner	Facilitator	Betjent

Tabel 7.2. Differentieret og situationsbetinget tilsyn (egen figur ud fra Miljøstyrelsen 1995 og Nielsen et al. 1994).

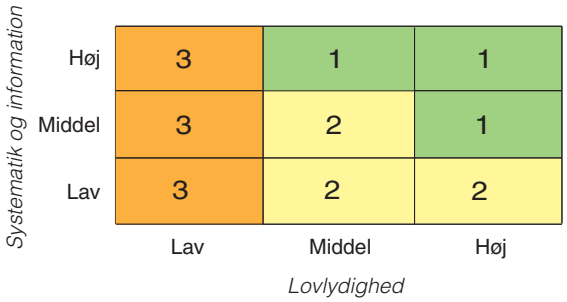
Effekten af det situationstilpassede tilsyn er afhængigt af kommunernes evne og vilje til at tage udfordringen op. Eksempelvis har kommunerne i Green Network i trekantsområdet i flere år arbejdet med at gøre flere virksomheder miljøpositive, og samtidig har de ændret praksis i tilsynsarbejdet – i hvert fald i en periode. I den anden ende af spektret har andre kommuner slet ikke set udfordringen i relation til renere teknologi og et differentieret tilsyn.

Ændringerne i miljøgodkendelserne med fokus på BAT og det differentierede tilsyn passer på papiret sammen med virksomhedernes forebyggende miljøarbejde i form af renere produktion og miljøledelse. Hvorvidt denne overensstemmelse også gælder i praksis, afhænger af den situationsbetingede relation mellem virksomheder og de decentrale miljømyndigheder.

Parallelt med at gebyret for godkendelser og tilsyn ændres i 2005 fra fast beløb afhængigt af type (godkendelsespligtig eller ikke) til en betaling pr. tidsforbrug, ændres karakteren af det differentierede tilsyn også. Frem for at møde forskelligartede virksomheder med forskellige virkemidler og tilsynsroller (som i tabel 7.2), så handler differentiering i vejledningen fra 2004 mere om forskellige frekvenser for tilsynet, afhængigt af hvordan virksomheden karakteriseres i forhold til niveau af henholdsvis lovlydighed og systematik i deres miljøarbejde, bl.a. implementering af (certificeret/verificeret) miljøledelse (se figur 7.3).

Fokus bliver i stigende grad på *tilsynsfrekvenser og -gebyrer*, som tilrettelægges ud fra ovenstående figur, hvor der over for de "røde" virksomheder med lav grad af lovlydighed gennemføres et intensiveret tilsyn, mens modsat de "grønne" virksomheder "honoreres" med færre tilsynsbesøg og dermed mindre gebyrer.

En evaluering af forenkling af miljøreguleringen konkluderer i 2010, at miljøtilsynsindsatsen generelt bliver nedprioriteret gennem 00'erne fra 646 årsværk i 2002



Figur 7.3. Differentieret tilsyn (Christensen og Bauer 2004).

til 437 årsværk i 2009. Vel at mærke samtidig med, at kommunerne bl.a. som følge af kommunalreformen i 2007 er blevet myndighed for et øget antal virksomheder (Ellegaard et al. 2010). Antal årsværk til miljøtilsyn bliver altså reduceret med en tredjedel, hvilket sker i en situation, hvor kommunerne har kunnet viderefakturere udgifterne til virksomhederne for det lovpligtige tilsyn. Den politiske virkelighed i kommunerne har altså været et ønske om *ikke* at pålægge virksomhederne ekstraudgifter, hvilket giver vanskelige rammebetingelser for en situationsbetinget differentiering.

En ekstra krølle i sammenhængen er, at Tilsynsvejledningen sondrer mellem en myndigheds- og en katalysatorrolle, hvor der *kun* kan opkræves gebyr ift. myndighedsrollen (Miljøstyrelsen 2006). Der er ikke klare retningslinjer, for hvad der kan betragtes som henholdsvis katalysator- og myndighedsrolle. Kommunerne kunne teste grænserne, jf. den tidligere diskussion omkring BAT. Det er imidlertid tydeligt, at de lokale myndigheder definerer myndighedsrollen snævert ift. opfølgning på tidligere fastsatte regler. Det kræver altså en eksplicit lokal politisk prioritering af katalysatorrollen og af et forebyggende miljøarbejde, hvilket har haft vanskelige vilkår først under kommunalreformen og siden under den økonomiske krise (Dirckinck-Holmfeld og Smink 2013).

Det kan endvidere diskuteres, om den frekvensbaserede differentiering har været ført ud i livet. I hvert fald svarer lige over 60 % af kommunerne, at tilsynet alene overholder minimumsfrekvensen; ligesom over 30 % har problemer med at overholde minimumsaftalen (Ellegaard et al. 2010).

Potentialet for miljøforbedringer findes imidlertid overvejende blandt de "gule" virksomheder i figur 7.3, dels fordi omkring 75 % af virksomhederne karakteriseres i denne kategori (< 10 % er "orange", og omkring 10-20 % er "grønne"), og dels fordi disse virksomheder netop ikke hidtil har haft en systematisk miljøindsats. De opgivne procentsatser er et skøn baseret på samtaler med kommunale miljøchefer;

men Ellegaard et al. (p. 42) angiver lignende tal og beskriver, at helt op mod 90 % af virksomhederne placeres i kategori 2 (de gule) i nogle kommuner.

Som led i kommunalreformen skete der en større overflytning af opgaver fra amterne til kommunerne, hvor der blev stillet krav om, at Teknik- og Miljøforvaltningerne indførte et kvalitetsledelsessystem for at sikre definerede tilsynsfrekvenser og mere ensartet kvalitet – på tværs af kommunestørrelser. Erfaringerne hermed er ikke evalueret; men det har givet medvirket til større ensartethed via udarbejdelse af tilsynsstrategi og indførelse af procedurer og instruktioner for tilsynsindsatsen. Via ledelsens evaluering er tilsynsarbejdet kommet højere op på ledelsens radar, og nogle kommuner har udarbejdet kompetenceprofiler med henblik på at finde "de rette" medarbejdere til tilsynet på den specifikke virksomhed.

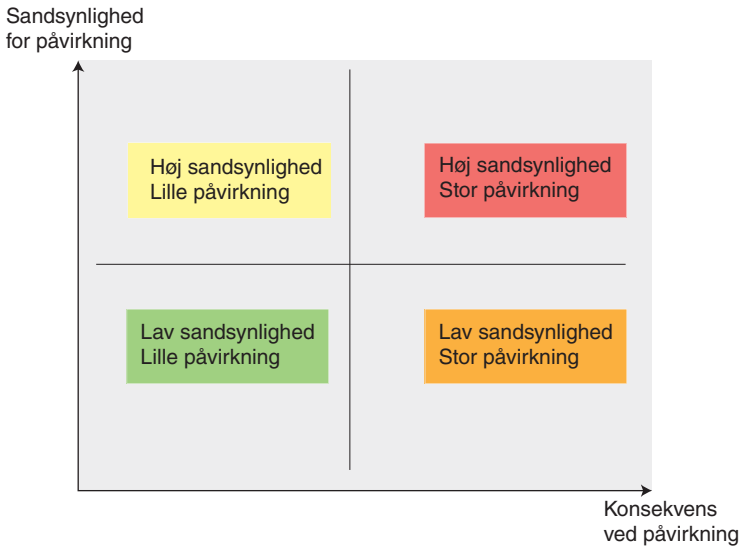
Som led i IE-direktivets implementering i Danmark er der lavet en ny tilsynsbekendtgørelse. Hidtil har tilsynskravene kun været reguleret gennem generelle formuleringer i miljøbeskyttelsesloven, diverse tilsynsvejledninger samt specifikke aftaler mellem miljøministeren og KL om bl.a. minimumsfrekvenser.

Den nye bekendtgørelse opstiller ud fra Virksomhedsudvalg II anbefalinger om at integrere minimumsfrekvens- og differentieringssystemet i et system bestående af basistilsyn, prioriterede tilsyn samt tilsynskampagner. Med basistilsyn sikres, at der føres tilsyn med alle virksomheder omfattet af tilsynsbekendtgørelsen minimum henholdsvis hvert tredje år (godkendelsespligtige) eller hvert sjette år. På baggrund af en risikovurdering af virksomhederne gennemføres der så yderligere prioriterede tilsyn på et udsnit af virksomhederne ud fra en score i forhold til såvel sandsynlighed for forurening (bestående af både historik, regelefterlevelse og miljøledelse) som konsekvenserne af eventuel forurening (ift. håndtering af farligt affald, emissioner samt omgivelsernes sårbarhed).

Effekten af disse ændringer af miljøtilsynet er det for tidligt at vurdere, men enkelte første udmeldinger fra kommunerne jævnførende blandt andet KL's høringssvar (www.kl.dk) indikerer, at de lokale myndigheder opfatter det etablerede system som administrativt ressourcekrævende ift. den mere omfattende kategorisering og elementer som tilrettelæggelse og offentliggørelse af tilsynsplan. Der peges dog på andre elementer, som giver mere fleksibilitet – bl.a. ift. kampagnemuligheder – men da det skal gennemføres inden for eksisterende rammer, frygter de reel nedprioritering af det udførende niveau, da der bruges mere tid på administration.

En revitalisering af miljøtilsynet i Danmark fordrer, at den rigide kvantitative fokusering på frekvenser og gebyrer bliver erstattet af eller i det mindste suppleret med et kvalitativt fokus på kompetencer, virkemidler, roller og relationer.

Et grundlæggende spørgsmål er, om de klassiske miljøproblemer ikke efterhånden er under kontrol, og at der kan opnås mere miljø for pengene ved en bredere miljø-



Figur 7.4. Miljøkonsekvensvurdering i udkast til Vejledning i Miljøtilsyn. www2.mst.dk (tilgået d. 26/8-2013).

forståelse og ved at anvende andre samarbejdsformer (se perspektiveringen). Dette er IKKE et argument for mindre regulering, men derimod for at give rum til, at myndighederne spiller en aktiv rolle i at motivere virksomhederne til en grøn omstilling.

Grønne regnskaber

Grønne regnskaber er eksempel på en sammenblanding af normative og informative virkemidler samt af selvregulering og offentlig regulering. For at give virksomhederne et yderligere incitament til selvregulering besluttede miljøminister Svend Auken i 1996 at gøre *grønne regnskaber* obligatoriske for over 1100 danske virksomheder.

Grønne regnskaber er et middel, der kan øge den enkelte virksomheds overblik over egne miljøforhold i form af ressourceforbrug og udledninger, og kan således medvirke til at igangsætte miljøforbedringer af produktionen. De grønne regnskaber har bidraget til satsningen på miljøledelse i dansk industri, da virksomhederne herigennem er blevet stimuleret til gradvist også at tage stilling til miljøpolitik, -mål, -handlingsplaner m.v. Med miljøledelse bliver miljøindsatsen fremadrettet, mens grønne regnskaber "kun" er en statusopgørelse.

Med revidering af lovgivningen i 2001 blev koblingen mellem miljøledelse og grønne regnskaber underbygget yderligere, ligesom de grønne regnskaber er forsøgt

koblet til miljøtilsynet. De grønne regnskaber har aldrig slået igennem som et informativt virkemiddel i samspillet mellem virksomheden og offentligheden (Sørensen et al. 1999). Ofte har primært studerende rekvireret de grønne regnskaber, som efterhånden mest bliver publiceret på nettet.

Som led i lempelse af de "administrative byrder" på virksomhederne blev kravene til de grønne regnskaber nedtonet i 00'erne. De grønne regnskaber lader til at have udspillet deres rolle i den nationale miljødebat, men de grønne regnskaber er stadig et muligt værktøj for dialog og samarbejde mellem virksomheden og den pågældende miljømyndighed.

Konklusion

Renere teknologi blev i 1990'erne synonym for en forebyggende miljøindsats og vandt tilslutning i industrien som en slags selvregulering. Parallelt skete der en opdatering af den offentlige miljøregulering, så miljøgodkendelser og miljøtilsyn principielt set understøtter indførelse af renere teknologi.

Miljøledelse er en formaliseret form for selvregulering, idet internationale standarder som ISO 14001 præciserer nogle "spilleregler," som virksomhederne skal følge. På denne baggrund er det muligt at foretage en sammenligning mellem selvregulering og offentlig regulering, eller rettere mellem miljøledelse og miljøgodkendelser. Som fremhævet må disse to reguleringsformer ses som komplementære med hver deres styrker og nødvendige roller (se tabel 7.3).

I 1990'erne var der et samspil mellem miljømyndighederne og dele af industrien, med en overordnet konsensus om, at forebyggelse havde første prioritet før genanvendelse, rensning og deponering – i prioriteret rækkefølge. Myndighederne skal fastlægge minimumsstandarder for virksomhedernes miljøpåvirkninger, ud fra hvad der kan opnås ved bedst tilgængelig teknologi, samt facilitere virksomhederne til at tage miljø- og ressourceudfordringerne seriøst. Samtidig skal virksomhederne påtage sig et øget ansvar for miljøet, og hvor frontløbervirksomheder via det gode eksempel synliggør fordelene ved løbende miljøforbedringer.

Kendetegnende for den forebyggende miljøindsats er imidlertid også usamtidighed bundet i forskellige forståelser af miljøproblemerne og af løsningsmulighederne og dermed en variation i virksomhedernes strategier og tilgange. Som konsekvens heraf har miljømyndighedernes modsvar været det differentierede miljøtilsyn, hvor myndigheder regulerer virksomhederne, som de nu engang gør sig fortjent til. Samspillet mellem virksomhedernes selvregulering og den normative regulering kan derfor være yderst forskelligartet. Den fremlagte forståelsesramme må følges op med konkrete undersøgelser af, i hvilken udstrækning forholdet virksomhed-myndighed varierer efter

Offentlig regulering: Miljøgodkendelser	Selvregulering: Miljøledelse
Lovbundet (drevet af myndigheder)	Frivilligt (drevet af virksomheder)
Tilsyn og kontrol	Verifikation af tredjepart (fx DS)
Tvungen overholdelse af krav og pålæg Direkte sanktioner i form af påbud, bøder etc.	Overholdelse af egne mål og handlingsplaner Indirekte sanktioner via krav fra samarbejdspartnere
Fokus på standarder for produktionen (delvist for produkterne)	Fokus på ledelsessystemer (EMAS & ISO 14001)
Definerede grænseværdier for udledninger baseret på anvendelse af bedst tilgængelig teknologi (BAT)	Virksomhederne definerer selv krav til miljøpræstationer ISO 14001 & EMAS stiller krav om løbende forbedringer
Offentlig adgang til information om blandt andet godkendelsesvilkår, tilsyn og egenkontrol, grønne regnskaber etc.	Offentlig adgang til miljøredegørelser ved EMAS ISO 14001 stiller kun krav om offentlig miljøpolitik og miljømål. Udlevering af andre oplysninger afgøres af virksomheden

Tabel 7.3. Forholdet mellem offentlig regulering og selvregulering (inspireret af Remmen & Smink 1999; Nash & Ehrenfeld 1996).

de lokale betingelser og sagsforløb. Som fremhævet har fokus for det differentierede tilsyn skiftet fra kompetence, roller og situationstilpasning over mod tilsynsfrekvenser og -gebyrer – groft sagt fra kvalitet til kvantitet.

Især skiftet fra rensning til renere teknologi er vigtigt. Så længe rensning havde høj prioritet, lå ansvaret for miljøet hos myndighederne, og myndighedskrav blev anset som det væsentligste virkemiddel til at forbedre industriens miljøforhold. Men den dag i dag er der stadig et indbygget modsætningsforhold i de lokale myndigheders funktion som forsyningsvirksomheder og så en forebyggende miljøindsats. Dilemmaerne er mange: fjernvarmeforsyning over for energibesparelser og lavenergibyggeri; affaldsindsamling og affaldsforbrænding over for affaldsminimering og genanvendelse; spildevandsanlæg med mangel på organisk materiale som følge af renere teknologi-indsatsen i eksempelvis fødevareindustrien. Disse dilemmaer er lige aktuelle efter 25 år med renere teknologi, hvilket senest debatten i 2012 om udbygningen af Amagerforbrændingen er et eksempel på.

Men renere teknologi har alligevel været en "mental kolbøtte" (et paradigmeskifte), dels i form af at ansvaret er blevet fælles mellem industrien og myndighederne, og dels ved at løsningerne er rykket ind i virksomhederne. Dele af industrien har påtaget

	Problemer	Løsninger	Aktører	Incita-menter	Miljø/ økonomi
Rensning	Udledninger	Filterløsning (end-of-pipe)	Myndighed	Myndigheds-krav	Omkostnin-ger
Renere produktion	Ressource-forbrug	Miljøopti-meret pro-duktion	Virksomhed	Reduktion af omkostnin-ger	Besparelser
Miljøledelse	Forudsæt-ninger	Løbende miljøforbed-ringer	Ledelse og medarbej-dere	Interessent-relationer	Image
Renere produkter	Produktets miljøpåvirk-ninger	Livscyklus-forbedringer	Produktkæde Interessenter	Produkt-dif-ferentiering	Konkur-rence-fordele

Tabel 7.4. Udviklingen i miljøindsatsen.

sig ansvaret for at nedbringe miljøpåvirkningerne fra produktionen, ligesom nogle virksomheder er gået skridtet videre ved at indføre certificeret miljøledelse eller andre enkle former for selvregulering.

Hvor ressourcebesparelser har været drivende for miljøoptimering af produktionen, så er nye aspekter i spil ved miljøledelse i form af organisationsudvikling, forbedret image og tættere relationer til en række samarbejdspartnere lige fra leverandører til myndigheder. Disse "bløde fordele" er vanskeligere at værdisætte end ressourcebesparelser, men ikke desto mindre kan de være nok så betydningsfulde. Med renere produkter bliver de potentielle fordele større, idet en differentiering af produktet på dets miljøegenskaber giver mulighed for at opnå konkurrencefordele på markedet. Udviklingen i miljøindsatsen kan ridses op som i tabel 7.4.

En anden form for *usamtidighed og variation* er, at problem- og løsningsforståelser, aktørrelationer og incitamentstrukturer er skruet forskelligt sammen i forskellige brancher. Tekstilindustrien og især farverierne har fulgt et generelt mønster fra rensning over renere produktion til miljøledelse; mens en enkelt virksomhed, Novotex, allerede sidst i 1980'erne lagde livscyklustankegangen til grund for deres produktkoncept – Green Cotton. Omvendt har elektronikindustrien aldrig været påvirket af myndighedskrav rettet mod produktionen med printpladefremstilling som en undtagelse, og branchens initiativer omkring miljøledelse kan derfor betragtes som selvregulering, dog understøttet med offentlige tilskudsmidler fra miljøledelsesprogrammerne.

Elektronikprodukter er de sidste 10 år blevet reguleret som følge af EU-direktiver omkring farlige stoffer og eco-design, og EU-miljøreguleringen bliver stadig mere

produktrelateret. Hvor miljømærker som den nordiske Svane og EU's Blomsten har været næsten ukendte inden for elektronik, så er især Svanemærket udbredt inden for den grafiske industri, som vel er det bedste danske eksempel på, at markedskræfterne har haft betydning for miljøindsatsen i en branche. Igen er det nødvendigt med analyser af brancher og delbrancher for at fastlægge de udbredte problem- og løsningsforståelser og relationerne mellem aktørerne, samt hvorledes incitamenter og drivkræfter konkret fungerer i den givne kontekst.

Den opmærksomme læser har givet lagt mærke til, at dette kapitel mangler at behandle industriens rolle i forhold til *bæredygtig udvikling*, bortset fra at det blev fremhævet i figur 7.1. Så lige et par bemærkninger herom.

Internationalt har flere af de store industrivirksomheder tilsluttet sig World Business Council for Sustainable Development, som siden Rio-topmødet har arbejdet for udbredelse af koncepter som "*eco-efficiency*" og "*triple bottom line*", hvor sidstnævnte indebærer, at virksomhederne bør tage ansvar for både "*profit, people and planet*" (Elkington 1998). Den tredobbelte bundlinje fremhæver altså, at virksomhederne ud over det traditionelle økonomiske profitmotiv også har et socialt og et miljømæssigt ansvar (se yderligere på wbcsd.com). Mange større virksomheder har således i dag både et økonomisk, et socialt/arbejdsmiljø- regnskab samt et grønt regnskab (se f.eks. Novo Nordisk på novo.dk). De større multinationale virksomheder har tilsluttet sig de 10 principper i FN's Global Compact om menneskerettigheder, miljø og socialt ansvar (unglobalcompact.org) og har etableret CSR – Corporate Social Responsibility Forum (se iblf.org), der formidler miljøinitiativer, standarder og retningslinjer rettet mod virksomhedernes sociale og miljømæssige ansvar.

Sammenslutninger og initiativer som disse repræsenterer, hvordan dele af industrien omformer og "oversætter" koncepter som f.eks. bæredygtig udvikling til noget operationelt for industrien. Hvorvidt og i givet fald i hvilket omfang de flotte ord også fører til ændret praksis i virksomhederne, er et oplagt tema for videre undersøgelser af "*walk the talk*".

Industriel økologi, bæredygtigt design, renere livsformer, bæredygtig produktion og forbrug, cirkulær økonomi m.v. er eksempler på koncepter og idéer, der på nogle punkter er mere helhedsorienterede, og som internationalt har fået større gennemslagskraft end i Danmark. Enkelte af disse begreber antyder desuden, at miljøproblemerne i samfundet ikke kan løses alene via teknologisk udvikling i form af renere produktion og produkter. Der er altså grund til at antage, at bæredygtig udvikling på sigt også vil fordre *sociale og strukturelle* ændringer i livsformer, forbrugsmønstre og -volumen etc.

Perspektivering – fremtidige udfordringer

Den forebyggende miljøindsats har været rettet mod produktionen inden for virksomhedernes hegn. Som fremhævet har den danske miljøpolitik gradvist også sat fokus på renere produkter og dermed på miljøpåvirkningerne i hele produktets livscyklus og på alle aktørerne i produktkæden. En produktorienteret miljøindsats fordrer, at markedet fungerer som drivkraft for udvikling af renere produkter. Dette er hidtil primært forsøgt opnået gennem øget satsning på informative virkemidler som miljømærkning, miljøvaredeklarationer etc.

I den samfundsmæssige diskurs er ansvaret for miljøet skiftet fra alene at have været myndighedernes til at være et fælles ansvar for virksomheder, myndigheder og andre interessenter. Parallelt hermed foregår der et skifte fra den traditionelle myndighedsregulering via lovgivning, til at forskellige virkemidler af frivillig karakter tages i anvendelse, og som kun virker via virksomhedernes egne initiativer, eller ved at forbrugerne ændrer deres præferencer og indkøb på markedet.

På sin vis er der opstået en stigende uoverensstemmelse mellem fokus i den nationale miljøregulering og så virksomhedernes fokus på miljø og bæredygtighed, og hermed på hvad der skaber værdi for virksomheden (se nedenstående tabel 7.5).

I relation til de globale udfordringer såsom klimaforandringer, øgede affaldsmængder, ressourcemangel, tab af biodiversitet m.v. har den lokale miljøregulering ingen fokus og næsten ingen virkemidler. Sat på spidsen: Den kommunale miljøregulering sikrer et ordentligt miljø i vores umiddelbare omgivelser, mens det globale miljø i form af klima og biodiversitet kollapser, samtidig med at en række ressourcer som

Nationalt fokus i miljøreguleringen	Virksomhedernes miljøfokus
Bedst tilgængelig teknologi (BAT) i produktionen	Grønne produkter og corporate social responsibility (CSR)
Optimal processtyring i forhold til energi, vand og affald	Ressourcebesparelser
Overholdelse af grænseværdier for indholdsstoffer i spildevandet og afkast	Udfasning af risikostoffer (forbudte / for farlige / dårlige for brandet)
Korrekt affaldshåndtering, guidet af affaldssystem	Spildreduktion
Reduktion af lugt, støv, støj	Godt forhold til naboerne
Grønne regnskaber for produktionen	Miljømærkning af produkt

Tabel 7.5. Forskelle i fokusering hos myndigheder og virksomheder (efter oplæg af Aalborg Kommunes miljøchef Michael Dam 2012).

energi, sjældne metaller, vand, fosfor m.v. bliver yderst knappe og danner grundlag for betydelige globale konflikter.

Der er brug for debat om, i hvilken udstrækning lokal og national miljøregulering og -politik kan være med til at reducere gabet mellem de globale udfordringer og en lokal/national miljøregulering. Kan kommunerne bidrage til at skabe værdi for virksomhederne ved at sætte fokus på de globale miljøudfordringer? Det vil i hvert fald kræve, at innovation, clean tech, forretningsudvikling og bæredygtig omstilling bliver andet end abstrakte begreber for kommunale miljømedarbejdere. Gate 21 i hovedstadsområdet, gate21.dk, og Netværk for Bæredygtig Erhvervsudvikling, nben.dk, i Nordjylland er eksempler på samarbejder mellem virksomheder, myndigheder og universiteter, hvor der i praksis bliver arbejdet med dette bredere miljøbegreb, jf. tabel 7.5. Flere kommuner har desuden ambitiøse mål for omstilling af energisystemet til vedvarende energi kombineret med energieffektiviseringer, har lavet en klimapolitik og/eller har udvalgt indsatsområder for en lokal bæredygtighedsstrategi.

De mange lokale initiativer i virksomheder, kommuner, NGO'er og i lokalsamfund giver grundlag for en vis form for optimisme. Også nationalt sker der en lignende udvikling, hvor energi og miljø kommer ind som centrale punkter i den nationale innovationspolitik (Regeringen 2012). Forsknings- og innovationspolitikken både i Danmark og i EU får med forskningsprogrammet Horizon 2020 fokus på de globale udfordringer.

Denne artikel er en bearbejdet og fornyet udgave af en tidligere artikel af Eskild Holm Nielsen & Arne Remmen: "Renere teknologi som miljøstrategi og virkemiddel", 2005. Den indledende historiske gennemgang er blevet opdateret, mens gennemgangen af forholdet mellem renere teknologi og miljøregulering i det store hele er skrevet på ny, hvilket også gælder for perspektiveringen.

En stor TAK for yderst værdifulde kommentarer til tidligere artikeludkast fra centrale spillere i udviklingen af renere teknologi og miljøreguleringen i Danmark: Niels Thorsen, Ernest & Young; Bjørn Bauer, PlanMiljø; Jens Peter Mortensen, Dansk Naturfredningsforening; Lene Nielsen og Michael Dam, Aalborg Kommune samt Stig Hirsbak og Ulrik Jørgensen, Aalborg Universitet.

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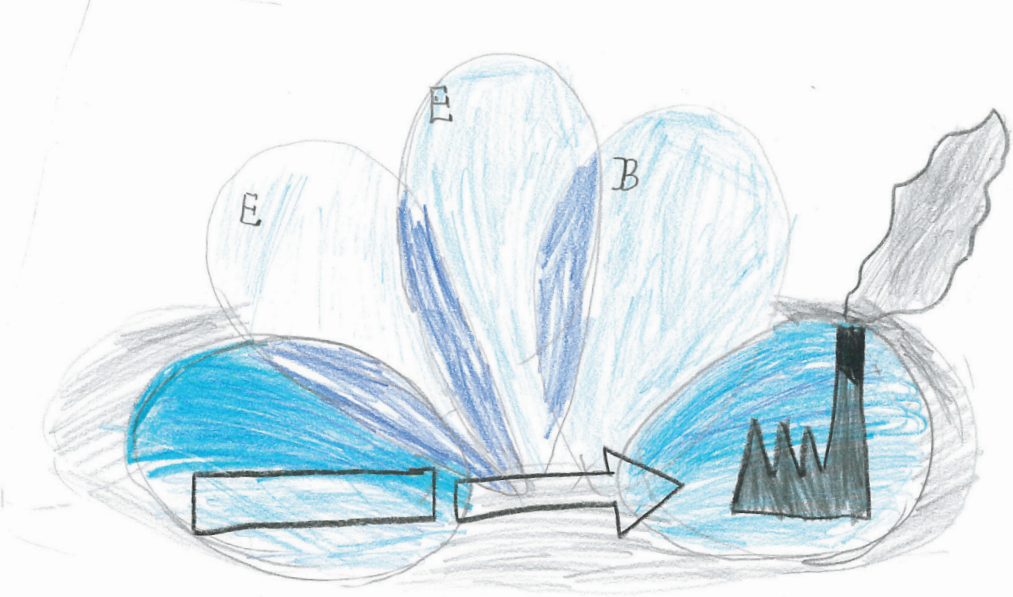

SUMMARY

How can local governments influence companies to reduce their climate change impacts? This overall problem is examined in this PhD thesis.
The PhD thesis is based on the experiences of seven Danish municipalities participating in the EU Life+ project, Carbon 20. Analyses are made of the municipalities' practises, activities and learning on how to influence local companies to reduce their greenhouse gas emission.
A conceptual framework of local governance and learning is introduced and six core analyses are made. Five of the analyses address distinct elements of the research:

- Challenges of the companies to implement energy savings
- Options for municipal environmental officers to address climate change and energy as part of the direct environmental regulation of companies
- Cooperation between municipalities and energy utilities on providing free of charge energy screenings
- The municipalities' activities to combine local business support with the climate and environmental agenda under the concept of green growth
- The learning and competences of the municipal officers.

The insights from these five analyses are combined into the sixth analysis as an assessment of the competencies needed to assist companies to address the highlighted challenges.

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